

SELECTED

SESOURCESABSTRACTS



VOLUME 8, NUMBER 24 DECEMBER 15, 1975

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior



VOLUME 8, NUMBER 24 DECEMBER 15, 1975

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established disciplineoriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Research and Technology U.S. Department of the Interior Washington, D. C. 20240

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SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER

Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation: Chemical Processes: Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING

Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA

Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS

Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES

Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION

Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

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ABSTRACT SOURCES

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

THE GRAPHICAL HYDROGRAPHS METHOD WITH THE INTERMEDIARY OF STORM OVERFLOWS AND FLOOD RETENTION TANKS (DAS GRAFISCHE AFLUSS-GANGLINIENVERFAHREN MIT ZWISCHENSCHALTUNG VON RUE UND RB), For primary bibliographic entry see Field 5D. W75-11861.

COMBINED WASTEWATER OVERFLOWS, Blume (John A.) and Associates, Engineers, San Francisco, Calif. For primary bibliographic entry see Field 5D.

SYSTEMS APPROACH TO HYDROLOGY.

Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, 1971. 464 p.

Descriptors: *Conferences, *Hydrology, *Systems analysis, *Hydrologic systems, *Statistical models, *Hawaii, Input-output analysis, Simulation analysis, Stochastic processes, Streamflow, Mathematical models, Synthetic hydrology, Runoff, Floods, Flood flow, Rainfallrunoff relationships, Precipitation(Atmospheric), Evapotranspiration, Groundwater, Network design, Regional analysis, Water yield, Water quality control, Watersheds(Basins), Streams erosion, Scour.

Identifiers: *Japan, Kinematic wave.

The seminar theme was 'The Systems Approach to Analysis of Hydrologic Processes and Environments.' Twenty papers, nine from Japan and eleven from the United States, were presented. At the end of each paper are summaries of discussion remarks and authors' responses. Titles of papers are: Stochastic Hydrologic Systems; Transforma-tion System in Flood Runoff Phenomena; The Structure of Inputs and Outputs of Hydrologic Systems; A Study of Long Range Runoff System Systems; A Study of Long Range Runoff System Response Based on Information Theory; Nonlinear Runoff Kernels of Hydrologic System; Linear Systems Analysis in Hydrology-The Transform Approach, The Kernel Oscillations and the Effect of Noise; Effect of an Error in Discharge Measurements on the Detection Process in Runoff Systems Analysis; Kernels of Stochastic Linear Hydrologic Systems; Hydrologic Systems in Hawaii; The Stochastic Kinematic Wave; Systems Simulation of Streamflows; Efficiency of Parameter and Sate Estimation Methods in Relation to Models of Lumped and Distributed Hydrologic Systems; Effects of Movement of Precipitation Area upon Runoff Phenomena; Nu-merical Simulation of Watershed Hydrology; An Application of Simulated Rainfall Models to Forecasting of the Long Term Variation of River Bed; Simulation of the Short-Time Scour-Fill Process in Erodible Streams with Stochastic Sedi-ment Transfer at the Stream Bed: Meteoroment Transfer at the Stream Bed; Meteoro-Hydrological Aspects of Rainfall in Japan; The Role of Network Design in the Management and Control of Streamflow Water Quality; A Three-Component, Nonlinear Water-Yield Model; and Hydrological Studies of Evapotranspiration and Groundwater Flow in Sandy Land. (See also W75-12015 thru W75-12032) (Humphreys - ISWS) W75-12014

STOCHASTIC HYDROLOGIC SYSTEMS, Illinois Univ., Urbana, Dept. of Hydraulic Engineering. V.T. Chow. In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 1-23, 1971. 4 fig. 3 tab, 10 ref. OWRT A-029-IL.L(6) 14-01-0001-1632.

Descriptors: *Hydrologic systems, *Stochastic processes, *Annual flood, *Time series analysis, *Water yield, Mathematical models, Evapotranspiration, Runoff, Rainfall, Analytical techniques, Model studies, Watersheds(Basins), Markov processes, Rainfall-runoff relationships, Precipitation(Atmospheric), Water storage, Identifiers: *French Broad River(NC), *Sangamon River(Ill), Basin storage, Power spectrum analysis

Hydrologic phenomena were simulated stochastic hydrologic systems in terms of mathematical models whose components are represented by stochastic processes. The proposed stochastic hydrologic model was based on a mathematical formulation of the principle of system continuity composed of component stochastic processes of precipitation, runoff, and evapotranspiration, plus losses and basin storage. Based on various assumptions two stochastic watershed system models were formulated and analyzed to illustrate the application of the proposed stochastic hydrologic model. One watershed system model was the annual stormflood model in which the input hourly rainfall of the annual storm was represented by a first-order nonhomogeneous Markov chain and the annual storm-flood by multiple linear regression. The rainfall and runoff relationship of the watershed was represented by a bivariate Markov process. The other watershed model was the watershed yield model in which the component hydrologic processes of precipitation, runoff, evapotranspira-tion, and basin storage were simulated as stochastic processes by time series to be determined by correlogram and power spectrum analy-sis. As numerical examples for analysis, the French Broad River basin above Bent Creek, North Carolina, was used as the watershed for the annual storm-flood model, and the upper Sangamon River basin above Monticello in east cen-tral Illinois was used as the watershed for the watershed yield model. (See also W75-12014) (Singh-ISWS) W75-12015

TRANSFORMATION SYSTEM IN FLOOD RUNOFF PHENOMENA,

Kyoto Univ. (Japan). Dept. of Civil Engineering. For primary bibliographic entry see Field 2E.

THE STRUCTURE OF INPUTS AND OUTPUTS OF HYDROLOGIC SYSTEMS, Colorado State Univ., Fort Collins. Dept. of Civil

Colorado State Univ., Fort Collins. Dept. of Civi Engineering. V. Yevievich.

In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 51-79, 1971. 12 fig, 3 ref. NSF GK-11444.

Descriptors: *Hydrologic systems, *Mathematical models, *Input-output analysis, *Model studies, *Systems analysis, Mathematical studies, Hydrology, Analytical techniques, Theoretical analysis, Equations, Stochastic processes, Correlation analysis, Time series analysis, Statistical methods, Rainfall, Streamflow, Probability, Hydrologic aspects.

A brief analysis leads to the conclusion that all water inputs and outputs of hydrologic environments are periodic-stochastic processes. To make a basic structural analysis of hydrologic processes

possible, ten hypotheses were given. Complex hydrologic processes of inputs and outputs, such as river flow and precipitation time series, are composed of periodic components in several parameters and an independent stochastic component. Periodicities in the mean and standard deviation may or may not be proportional. Techniques for making inferences about significant harmonics were outlined for both cases. Nonparametric and parametric methods of removing these periodicities from a series were given and the autocorrelation coefficients of standardized series were shown to be periodic also. To obtain the independent stochastic components of the second-order stationarity, periodicities in the mean, standard deviation, and autocorrelation coefficients can be removed. Complex hydrologic series are not third-order stationary either. The shapes of distributions of stochastic independent components for discrete series of small time units (say one day) require the fitting of probability density functions of an unfamiliar type to hydrology. (See also W75-12014) (Humphreys - ISWS)

A STUDY OF LONG RANGE RUNOFF SYSTEM RESPONSE BASED ON INFORMATION THEORY.

THEORY, Kyoto Univ., (Japan). Dept. of Civil Engineering. T. Ishihara, and S. Ikebuchi.

In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 80-101, 1971. 12 fig. 4 tab, 15 ref.

Descriptors: *Rainfall-runoff relationships, *Stochastic processes, *Hydrologic systems, *Statistical methods, Correlation analysis, Hydrology, Mathematical studies, Systems analysis, Analytical techniques, Runoff, Unit hydrographs, Synthesis, Precipitation(Atmospheric), Rainfall, Snowmelt, Dishcharge(Water), River flow, Base flow.

Long-range runoff phenomena are essentially stochastic processes. To understand them, their deterministic characteristics and the statistical laws involved in the system of transition between precipitation and river discharge must be known. Methods were proposed for the analysis and synthesis of a long-range runoff response based on the ideas and techniques of information theory. First, statistical properties of daily precipitation and river discharge series were discussed through their correlation analysis; then, after time-invariant linearization of the runoff system according to the physical mechanisms in the runoff phenomena, the unit-impulse response function designated as the 'statistical unit hydrograph' was derived from the Wiener-Hoph equation. Statistical unit hydrographs that take into account both the variations of the water content in the subsurface stratum during the rainy season and the daily snow melt water input to the system in the snow melt season were proposed. Results of these procedures applied to the Yura River basin were in good agreement with the natural stream records. (See also WT5-12014) (Humphreys - ISWS)

NONLINEAR RUNOFF KERNELS OF HYDROLOGIC SYSTEM,

Tokyo Inst. of Tech. (Japan). Dept. of Civil En-

gincering. M. Hino, T. Sukigara, and H. Kikkawa

In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 102-115, 1971. 6 fig, 17 ref, 1 append.

Field 2—WATER CYCLE

Group 2A-General

Descriptors: *Hydrologic systems, *Stochastic processes, *Inputioutput analysis, *Runoff, Runoff forecasting, Floods, Theoretical analysis, Mathematical studies, Statistical methods, Hydrograph analysis, Precipitation excess, Correlation analysis, Hydrology, Rainfall.

Identifiers: Nonlinear stochastic processes, Non-linear runoff kernels.

In recent years, great strides have been made in the area of stochastic hydrology. A lot of quantitative information on hydrologic phenomena has been derived reasonably from statistical hydrologic data. However, studies from a point of view of non-linear stochastic process are rather few and not necessarily successful. A method was described of deriving the nonliner 'runoff kernels' based on the Wiener theory of nonlinear random process, together with comments on the results obtained from applying method to a daily rainfall-runoff process for a real basin. It was shown that the short-period runoff component shows strong nonlinearity at a short lag-time, while a weak non-linearity was also found for the long term runoff component. The predictability for heavy daily rainfall was shown to be increased considerably In an appendix, the importance of the probability distribution of rainfall and runoff data was discussed, stressing that the preliminary processing to transform these data into random variables with Gaussian probability distribution will further improve the efficiency of linear or nonlinear stochastic hydrologic theories. (See also W75-12014) (Humphreys - ISWS)

EFFECT OF AN ERROR IN DISCHARGE MEA-SUREMENTS ON THE DETECTION PROCESS IN RUNOFF SYSTEMS ANALYSIS

Hokkaido Univ., Sapporo (Japan). Dept. of Civil

Engineering. T. Kishi.

1. Kish.

In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 143-162, 1971. 9 fig, 3 ref.

Descriptors: *Runoff, *Systems analysis, *Mathematical studies, *Theoretical analysis, Discharge(Water), Velocity, Measurement, Reliability, Flow measurement, Methodology, Reservoirs, Turbulence, Flow characteristics, Rainfall. Identifiers: *Error, Observation error, Truncation

A river basin acts as a low pass filter in the predic-tion process and becomes an amplifier for high frequency bands in the detection process. Theoretical considerations were made about the detection process for a basin of cascade-con-nected linear reservoirs. Theoretically, the possi-bility of obtaining the time function of input depends on the functional form of the output and on the order of the system or the number of linear reservoirs. An approximate method of calculation by which the Fourier inverse transform of the deby which the Fourier inverse transform of the de-tected input function is always integrable was presented. Results of calculations using field data were described as illustrative examples. It was pointed out that the precision of the detected values of the input decreases markedly if even a small error is contained in the measurements of the output. Also investigated was the relation of hurbulence characteristics of natural streams to the turbulence characteristics of natural streams to the error in velocity measurements which must be a significant factor affecting the total error in discharge measurements. The error in velocity dischage measurements. The error in Velocity measurements can be decreased appreciably if the observational period at a point is prolonged by a small fraction of time. (See also W75-12014) (Humphreys - ISWS) W75-12020

OF STOCHASTIC LINEAR KERNELS HYDROLOGIC SYSTEMS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.

R. G. Quimpo.

In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 163-185, 1971. 4 fig. 20 ref.

Descriptors: *Hydrologic systems, *Stochastic processes, *Runoff, *Mathematical models, Mathematical studies, Analytical techniques, Model studies, Input-output analysis, Systems analysis, Hydrology, Synthetic hydrology, Simulation analysis, Markov processes.

Identifiers: Linear stochastic processes, Autoregression model

toregression model.

Using operational methods of analyzing linear systems, kernels corresponding to current stochastic models of hydrologic time series were obtained. It was shown that these models essentially assume the form of the kernel of the linear tany assume the form of the kerner of the linear system in terms of undetermined parameters as contrasted with the approach which requires the solution of the Wiener-Hopf equations. Markov solution of the wiener-nopt equations. Markov second and third order autoregressive models equivalent to two types of self-similar models for a typical river were obtained using a least-square criterion on the kernel. To compare the re-scale range properties of synthetic data using different generating techniques, 2400 years of record were synthesized for each of five models. Visual inspection of respective re-scaled-range vs. length-ofrecord plots suggested essentially the same result for the range regardless of which model was used to generate data. (Humphreys - ISWS) data (See also W75-12014) W75-12021

HYDROLOGIC SYSTEMS IN HAWAII,

Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.

C. Ekern, L. S. Lau, F. L. Peterson, S. Price,

and R. Pulfrey.

In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 186-201, 1971. 6 fig.

Descriptors: *Hydrologic systems, *Rainfall, *Groundwater, *Hawaii, Geologic history, Geology, Climates, Evaporation, Solar radiation, Floods, Hydrology, Islands, Volcanoes, Transpiration

Geologic history, rainfall climate, evaporation and transpiration, flood hydrology, and geology and groundwater under Hawaiian conditions were each briefly presented. The Hawaiian islands are a chain of shield-shaped basaltic domes built over a 1600 mile fissure of the ocean floor which has existed probably since at least Middle Tertiary (about 30 million years). The major climatic controls in Hawaii are exercised by the tropical locale, the surrounding ocean, and the Pacific anticyclone the surrounding ocean, and the Pacific anticyclone and topography. Each of the major islands has its distinctive terrain, but their mean rainfall distributions have certain features in common. Great variations of rainfall occur within small distances and with elevation. In some areas, mean annual rainfall increases by 75 inches for each 1000 feet of elevation and 2 or 3 miles of distance. On all the major islands, localities with over 300 inches of rain a year and others with less than 20 inches a year may be 20 miles or less apart. Hawaii's most serious hydrologic problem, other than long-range water resources management and planning, flash flooding. Two general modes of groundwater occurrence are present in the Hawaiian islands: high-level groundwater and basal groundwater. Dikes in and near the rift zones of the volcanoes impound large volumes of fresh water. The principal source of fresh groundwater in the Hawaiian cipal source of tresh groundwater in the Hawanan islands is the lens-shaped basal water body, com-monly called the Ghyben-Herzberg lens, floating on denser salt water. (See also W75-12014) (Humphreys - ISWS)

W75-12022

THE STOCHASTIC KINEMATIC WAVE,
Massachusetts Inst. of Tech., Cambridge. Dept. of

Civil Engineering.

P. S. Eagleson.

In: Systems Approach to Hydrology; Proceedings the First Bilateral U.S.-Japan Seminar Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 202-225, 1971. 7 fig. 1 tab, 14

Descriptors: *Hydrologic systems, *Stochastic processes, *Hydrographs, Streamflow forecasting, Mathematical models, Rainfall-runoff relaing, Maintematical moders, Rainfain-Fution Teach tionships, Streamflow, Runoff, Overland flow, Watersheds(Basin), Storm runoff, Runoff forecasting, Peak discharge, Annual, Flood frequency, Rainfall, Precipitation excess.

The kinematic wave method of hydrograph forecasting was generalized through the incorporation of random variations in the temporal and areal distribution of storm rainfall excess. Expressions were derived for the peak direct runoff and streamflow in terms of the statistics of these random variables. Generalized probability density functions of storm duration and storm rainfall depth (given duration, an assumed loss function, and an assumed probability density function) for a runoff-producing area were used with the stochastic equations for maximum direct storm runoff to derive the probability density function of peak streamflow. The latter was used to obtain the classical flood-frequency curve as an explicit function of parameters defining the rainfall dis-tributions and the catchment-stream phsiography. The flood-frequency relation was used to derive the mean annual flood as a function of catchment area and this compared well with observations from 44 Connecticut rivers. Agreement of the predicted flood-frequency curve with observation on particular catchments was also good but was ap-parently sensitive to the particular value of the direct runoff fraction and to the fraction of the catchment area contributing direct runoff. (See also W75-12014) (Humphreys - ISWS) W75-12023

SYSTEMS SIMULATION OF STREAMFLOWS, Kyoto Univ., (Japan), Dept. of Civil Engineering. For primary bibliographic entry see Field 2E. W75-12024

EFFICIENCY OF PARAMETER AND STATE ESTIMATION METHODS IN RELATION TO MODELS OF LUMPED AND DISTRIBUTED HYDROLOGIC SYSTEMS,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 246-278, 1971. 67 ref. OWRT Collins, Colorad B-007-ARIZ(14)

Descriptors: *Hydrologic systems, *Systems analysis, *Model studies, *Decision making, *Reviews, Hydrology, Optimization, Theoretical analysis, Efficiences, Stochastic processes, Statistical methods, Input-output analysis, Risks, Calibration, Time sortice analysis Calibrations, Time series analysis.
Identifiers: Bayesian decision theory, Model

A review of the important philosophical and practical issues inherent in modeling and parameter estimation errors was given. Included was a discussion of the identification problem and its relation to optimization theory and statistical estimation theory. System determinacy and indeter-

minacy was defined in terms of the number of variables, data points, and equations and then further elaborated in terms of design, identification, and parameter estimation problems. In view of the proliferation of hydrologic models and an apparent polarization of viewpoints on modeling, some issues involved in choosing among models were presented. These include model validation, apparent and inherent randomness, and lumped and distributed parameter models. The latter models were interpreted by a frequency domain method; a heat flow problem was modeled by both methods and interpreted in terms of autocorrelation and spectrum functions for the lumped model. Objective and subjective criteria were presented for validation of hydrologic models. An outline of Bayesian decision theory was presented and then applied to evaluating the cost of uncertainty in the design of bridge piers. The uncertainty exists in the mean and variance of the log-normal distribution used to describe the annual peak flows on Rillito Creek in Tucson, Arizona. A model for evaluating the worth of additional hydrologic data was also presented. (See also (Humphreys - ISWS) W75-12025

EFFECTS OF MOVEMENT OF PRECIPITA-TION AREA UPON RUNOFF PHENOMENA,

Tokyo Univ., (Japan). Dept. of Civil Engineering. Y. Takahasi, K. Mushiake, and T. Hashimoto. In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p. 279-294, 1971. 12 fig. 5 ref.

Descriptors: "Hydrographs, "Hydrologic systems, "Model studies, "Runoff, Mathematical models, Watersheds(Basins), Storm runoff, Storms, Movement, Velocity, Rainfall, Spatial distribution, Precipitation(Atmospheric). Identifiers: "Japan, "Kanna River.

Model simulation of streamflow hydrographs usually assumes that rainfall is distributed uniformly over the watershed. But, in reality, rainfall may vary considerably in time and in space. For floods in small river basins (less than several hundred square kilometers) in Japan, effects of the spatial distribution and movement of precipitation storm cells especially cannot be ignored. The effects of the distribution of precipitation and its movement upon storm hydrographs were reported. The use of a hydraulic runoff model was applied as the method of runoff analysis. The model was solved numerically. Studies about effects of the various characteristics of storm area upon flood hydrographs were carried out by means of numerical experiments on two kinds of simplified catchment model. At the same time, several properties of the model catchment were studied. Characteristics of rain storms, such as scale, distribution, direction, and velocity, were investigated through analyses of hydrological data in the Kanna River Basin. Comparisons between computed and observed hydrographs caused by a storm passing over the basin showed good agreement for the peak flow and the rising limb of the hydrograph, but agreement was not good for recession limb. (See also W75-12014) (Humphreys W75-12026

NUMERICAL SIMULATION OF WATERSHED

HYDROLOGY, Texas Univ., at Austin. Dept. of Civil Engineering. W. L. Moore, and B. J. Claborn.

In: Systems Approach to Hydrology: Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 295-325, 1971. 12 fig. 5 tab, 11 ref.

Descriptors: *Rainfall-runoff relationships, *Simulation analysis, *Synthetic hydrology, Stochastic processes, Watersheds(Basins), Water storage, Soil moisture, Mathematical models, Streamflow, Soil water movement, Rainfall, Infiltration, Runoff, Computer programs.

Identifiers: *Stanford Watershed Model, Fortran IV.

In translating the Stanford Watershed Model into Fortran IV, several modifications were made in the manner of treating depression storage, infiltration, soil moisture storage, and soil moisture movement. The result was a program variation for simulating the physical processes occuring in a watershed. The rainfall input was stored and transferred to various elements using mathematical relations based on physical processes. Most parameters have physical interpretation and with experience can be estimated with at least some degree of precision. The simulation emphasized surface storage, infiltration, and soil moisture phases as significant in determining the amount of streamflow. The time distribution of runoff was treated by means of a distribution graph. Limited results were included for application to two watersheds. (See also W75-12014) (Jess-ISWS)

AN APPLICATION OF SIMULATED RAINFALL MODELS TO FORECASTING OF THE LONG TERM VARIATION OF RIVER BED,

Osaka Univ. (Japan). Dept. of Civil Engineering. For primary bibliographic entry see Field 2J. W75-12028

SIMULATION OF THE SHORT-TIME SCOUR-FILL PROCESS IN ERODIBLE STREAMS WITH STOCHASTIC SEDIMENT TRANSFER AT THE STREAM BED, Utah Water Research Lab., Logan.

For primary bibliographic entry see Field 2J.

METEORO-HYDROLOGICAL ASPECTS OF

RAINFALL IN JAPAN. Meteorological Research Inst., Tokyo (Japan). Typhoon Research Lab. For primary bibliographic entry see Field 2B. W75-12030

A THREE-COMPONENT, NONLINEAR WATER-VIELD MODEL

WATER-YIELD MODEL, Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center. W. M. Snyder, W. C. Mills, and J. C. Stephens. In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 428-443, 1971. 8 fig, 2 tab, 8

Descriptors: "Rainfall-runoff relationships, analysis, "Synthetic hydrology, Stochastic processes, Mathematical models, Streamflow, Water yield, Runoff, Rainfall, WatershedstBasins), Discharge(Water), Identifiers: "Rainfall-runoff models.

A three-component, nonlinear model was developed and tested on three experimental watersheds. Input data were rainfall in 5-day periods. The first component expressed physical characteristies of the watershed in terms of a potential for water yield. The second varied with watershed wetness and related transmission of potential yield to the watershed outlet. The final component was a seasonal-loss function. Input rainfall was diminished by this function to produce 5-day amounts of rainfall. Output was volume of streamflow for synchronous 5-day periods. (See also W75-12014) (Jess-ISWS)

HYDROLOGICAL STUDIES OF EVAPOTRANS-PIRATION AND GROUNDWATER FLOW IN SANDY LAND.

National Research Inst. of Agricultural Engineering, Hiratsuka (Japan). For primary bibliographic entry see Field 2D. W75.1932

PREDICTIVE MODELS FOR GREAT LAKES HYDROLOGY.

State Univ. of New York, Buffalo. Dept. of Civil Engineering.
D. D. Meredith.

Water Resources Bulletin, Vol 11, No 3, p 526-535, June 1975, 5 tab, 6 ref, append. OWRT B-062-ILL(4), 14-31-0001-3580.

Descriptors: "Great Lakes, "Simulation analysis, "Hydrology, 'Model studies, Hydrologic data, Precipitation(Atmospheric), Evaporation, Runoff, Water balance, Regression analysis, Water temperature, Statistical models, Lakes, Statistics. Identifiers: Theisson polygon method.

A study was undertaken to develop predictive models for Great Lakes hydrology which could be used in simulation studies to investigate alternative operating rules. The individual hydrologic components were assumed to be normally distributed for each month, and linear regression equations were estimated for predicting the value of the individual monthly hydrologic components. It was shown that some of the hydrologic components for downwind (in this case, downstream) lakes were dependent on hydrologic events for the upwind lakes. This was particularly so for precipitation in the downwind lake basins which appeared to be dependent on evaporation values for upwind lakes. Therefore, any change in the hydrology of an upwind lake would cause a change in the hydrology of the downwind lakes. (Roberts-ISWS)

2B. Precipitation

THE STOCHASTIC AND CHRONOLOGIC STRUCTURE OF RAINFALL SEQUENCES - APPLICATION TO INDIANA.

PLICATION TO INDIANA, Purdue Univ., Lafayette, Ind. Water Resources Research Center.

M. I.. Kavvas, and J. W. Delleur.

Available from the N ational Technical Information Service, Springfield, Va 22161, as PB-245 257, 57.25 in paper copy, \$2.25 in microfiche. Purdue University Water Resources Research Center Technical Report No. 57, 1975, 199 p, 62 fig. 32 tab, 83 ref, 3 append. OWRT B-036-IND (10).

Descriptors: *Rainfall, Stochastic Processes, *Indiana, Precipitation, Central U.S., Statistical Methods.

Identifiers: *Rainfall, *Sequences, *Rainfall Occurrences, Rainfall Counts, Neyman-Scott Cluster Process, Autoregressive Moving Average Model.

The report is in two parts: the first is concerned with the point stochastic analysis of the daily rainfall occurrence in Indiana, and the second with the time series analysis of the monthly and the annual rainfall sequences at various stations in Central United States. The point statistical analysis utilized some statistical functions and tests of hypotheses. There are cyclicities both in the first and second moments of the point stochastic process. Physically meaningful annual and 15-day cycles were found to be significant. There is a slight downward trend in the rate of daily occurrence in Indiana. The Neyman-Scott cluster process was constructed in the time dimension to model this physical persistence. The model fit the data well. In the time series analysis, a theoretical and empirical analysis of the removal of cyclicities used for the generation purposes although it did

Field 2—WATER CYCLE

Group 2B—Precipitation

remove the cyclicities in the data. Standardization, although it introduces some spurious nonstationarities into the data, is an acceptable method for generation purposes. A spectral and a vari-ance-time analysis of the ARIMA family of the hydrologic time series models was done to study their long range dependence characteristics. For the annual rainfall series a white noise model with normally distributed residuals is adequate and can be used for hydrologic simulation purposes in the Central United States. W75-11854

ERRORS AND FLUCTUATIONS OF RAIN-GAUGE ESTIMATES OF AREAL RAINFALL, McGill Univ., Montreal (Quebec). For primary bibliographic entry see Field 7A. W75-11933

DISTRIBUTION OF AQUATIC MACROPHYTES RELATED TO PAPER MILL EFFLUENTS IN A SOUTHERN MICHIGAN STREAM,

Southeast Missouri State Univ., Cape Girardeau. Dept. of Biology.

R. G. Kullberg.
American Midland Naturalist, Vol 91, No 2, p 271-

281, 1974. 3 fig, 3 tab, 18 ref.

Descriptors: *Aquatic plants, *Distribution, *Streams, *Michigan, Volume, Standing crops, Turbidity, Chemical properties, Pollution abatement, Pulp wastes, Ammonia, Sulfates, Lignins, Speciation, Peat.

Identifiers: *Portage Creek(Michigan), Tannins, Nasturtium officinale, Potamogeton pectinatus, Potamogeton crispus, Sparganium americanum, Elodea canadensis. Plant cover

Distribution of macrophyte cover, volume, and standing crop along Portage Creek near Kalamazoo, Michigan, were estimated. The stream begins in an unpopulated, uncultivated area and flows into an urban area where it received a proper will weater offer which counties. paper mill wastes, after which aquatic macrophytes were absent. Another study made one year after cessation of paper mill effluents showed a ten-fold reduction in turbidity in the polluted portion of the stream, suggesting that turbidity was the most probable cause for the earlier absence of macrophytes. Concentration of disasserted in macrophytes. Concentration of dis-solved substances was low and relatively stable in the upper reaches. Ammonia, sulfate, and tannin-lignin concentrations increased in the lower reaches. Down-stream the only cover was by Nasturtium officinale. The substrate cover by macrophytes was 41% in the upstream unpolluted portion. The two dominant species were Potamogeton pectinatus and Sparganium amerrotatingeton pecuniatis and Sparganium anericanum. Aquatic macrophytes occupied 0.043% of the water volume. Of the ten species found, Nasturtium officinale, Potamogeton crispus, P. pectinatus, and Elodea canadensis occupied 82.8% of total plant volume and comprised 83.3% of dry of total plant volume and comprised 83.3% of dry weight. Length of growing season, mean annual temperature, concentration of dissolved substances, and shallow water were responsible for the low standing crop and number of species. (Buchanan-Davidson--Wisconsin) W75-11991

HYDROLOGIC SYSTEMS IN HAWAII,

Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science. For primary bibliographic entry see Field 2A. W75-12022

METEORO-HYDROLOGICAL ASPECTS OF RAINFALL IN JAPAN.

Meteorological Research Inst., Tokyo (Japan). Typhoon Research Lab.

In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S. Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 379-394, 1971. 18 fig. 4 ref. Descriptors: *Climatic zones, *Rainfall intensity, *Foreign countries, *Frequency curves, Rainfall, Geographical regions, Rainfall disposition, Dis-tribution patterns, Diurnal, Precipitation excess, Topography, Climatology, Climatic data, Orography, Cloud bursts, Duration curves, Frequency, Rates, Depth, Areal, Monsoons, Typhoons. Identifiers: *Japan.

The distribution of the regional division of heavy rainfalls in Japan and its meteorological causes were briefly described. Those distributions coincided very well with that of the climatic provinces. Based on the results of climatological studies in Japan, it was suggested that the climatic province is available for estimation of the various hydrological values as follows: (1)the characteristics of depth-duration and intensity-duration curve, (2)regional change of rainfall amount and its intensity, and (3)recurrence interval of rainfall amount. Study results were presented in graphical form. (See also W75-12014) (Humphreys - ISWS) W75-12030

ENVIRONMENTAL RESEARCH LABORATO-

RIES, 1973 ANNUAL REPORT.
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab. For primary bibliographic entry see Field 5A. W75-12033

LIDAR VS. PHOTOMETER, A ONE MONTH

COMPARISON, National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab. For primary bibliographic entry see Field 5A. W75-12036

THE SIMPLE ATDL URBAN AIR POLLUTION

MODEL, National Oceanic and Atmospheric Administra-tion, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab. For primary bibliographic entry see Field 5A. W75-12038

DIFFUSION ESTIMATION FOR SMALL EMIS-SIONS, National Oceanic and Atmospheric Administra-

tion, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab. For primary bibliographic entry see Field 5A. W75-12039

1974 WATER RESOURCES DATA FOR OREGON, SURFACE WATER RECORDS, PRECIPITATION RECORDS,

Oregon State Engineers Office, Salem. Water Resources Dept.
For primary bibliographic entry see Field 7C. W75-12087

WEATHER MODIFICATION: WHERE ARE WE NOW AND WHERE SHOULD WE BE GOING. AN EDITORIAL OVERVIEW, National Hurricane and Experimental Meteorolo-

For primary bibliographic entry see Field 3B. W75-12088

ON THE VARIABILITY OF 'DYNAMIC SEEDA-BILITY' AS A FUNCTION OF TIME AND LO-CATION OVER SOUTH FLORIDA: PART I.

CATION OVER SOUTH FLORIDA: PART I. SPATIAL VARIABILITY,
National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.
For primary bibliographic entry see Field 3B.
W75-12089

A DETAILED MICROPHYSICAL SIMULATION OF HYGROSCOPIC SEEDING ON THE WARM

RAIN PROCESS, South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences. For primary bibliographic entry see Field 3B. W75-12090

FLORIDA AREA CUMULUS EXPERIMENTS

1970-1973 RAINFALL RESULTS, Virginia Univ., Charlottesville, Dept. of Environ-mental Sciences; and Virginia Univ., Charlottesville. Center for Advanced Studies. For primary bibliographic entry see Field 3B. W75-12091

SMALL-SCALE VARIABILITY OF HAIL AND ITS SIGNIFICANCE FOR HAIL PREVENTION

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 3B. W75-12092

FORMATION OF GRAUPEL.

Naval Weapons Center, China Lake, Calif. For primary bibliographic entry see Field 3B. W75-12093

HAIL SUPPRESSION DATA FROM WESTERN NORTH DAKOTA, 1969-1972, South Dakota School of Mines and Technology,

Rapid City. Inst. of Atmospheric Sciences For primary bibliographic entry see Field 3B. W75-12094

DESIGN OF A HAIL SUPPRESSION PROJECT FOR ILLINOIS,

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 3B. W75-12095

THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUN-TAINS AND THEIR MODIFICATION BY AR-TIFICIAL SEEDING, PART I: NATURAL CON-DITIONS.

Washington Univ., Seattle. Dept. of Atmospheric Sciences. For primary bibliographic entry see Field 3B.

W75-12096

A NUMERICAL MODEL OF PRECIPITATION FROM SEEDED AND UNSEEDED COLD ORO-GRAPHIC CLOUDS,

Denver Research Inst., Colo. For primary bibliographic entry see Field 3B. W75-12098

TESTING OF CLOUD SEEDING MATERIALS AT THE CLOUD SIMULATION AND AERSOL LABORATORY, 1971-1973, Colorado State Univ., Fort Collins. Dept. of At-

mospheric Science. For primary bibliographic entry see Field 3B. W75-12099

AN EXPLANATION FOR THE UNUSUAL NUCLEATING ABILITY OF AEROSOLS PRODUCED FROM THE AGI-NH4I-ACETONE SYSTEM

South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences For primary bibliographic entry see Field 3B. W75-12100

ANALYSIS OF RADAR OBSERVATIONS OF A RANDOMIZED CLOUD SEEDING EXPERIMENT.

South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences. For primary bibliographic entry see Field 3B. W75-12101

COMPARISON OF GAGE AND RADAR METHODS OF CONVECTIVE RAIN MEASUREMENT.

MENT, National Oceanic and Atmospheric Administration, Coral Gables, Fla. Experimental Meteorolowy Lab

gy Lab. W. L. Woodley, A. R. Olsen, A. Herndon, and V. Wiggert.

Journal of Applied Meteorology, Vol 14, No 5, p 909-928, August 1975. 18 fig, 6 tab, 26 ref.

Descriptors: *Rainfall, *Rain gages, *Radar, *Florida, Measurement, Remote sensing, Networks, Analytical techniques, Depth-areas curves, Precipitation(Atmospheric), Rain, Rainfall disposition, Areal, Isohyets, Reliability, Meteorology.

Meteorology.

Gage and radar methods of convective rain measurement were compared in the context of the continuing multiple cloud seeding experiment of the Experimental Meteorology Laboratory (EML). An optimal system, combining the best features of both, was recommended. The nature of the Florida convective rainfall measured was documented using measurements from a dense raingage mesonet (about 3 sq km per gage over 570 sq km) that was operated for a total of 93 days in 1971 and 1973. The gaging requirements for detection and measurement of 24 hour rainfalls in the mesonet were determined using the full complement of gages as the standard. For the measurement of areal convective rainfall greater than 0.25 mm within a factor of 2 on 90, 70 and 50% of the days, gage densities of 31, 91 and 208 sq km per gage, respectively, were required. The daily representation of rainfall by the radar improves if one adjusts it using gages. In the mean, adjustment produced a statistically significant 15% improvement in radar accuracy. The adjusted radar measurements than had an approximate gage density equivalence of 25 sq km per gage. For the measurement of the rainfall from individual showers anywhere, the gageadjusted radar is far superior to gages alone. For measurement in a fixed area the size of the mesonet, gages are superior to radar. To measure rainfall over the EML target either gages alone, or a radar adjusted by gages, can accomplish the task. (Sims-ISWS) W75-12102

ON THE EFFECT OF NATURAL RAINFALL VARIABILITY AND MEASUREMENT ERRORS IN THE DETECTION OF SEEDING EFFECT, Battelle-Northwest, Richland, Wash. For primary bibliographic entry see Field 3B.

THE EFFECT OF PERSISTENCE OF AGI ON RANDOMIZED WEATHER MODIFICATION EXPERIMENTS.

Bureau of Reclamation, Denver, Colo. For primary bibliographic entry see Field 3B. W75-12104

ON THE DESIGN AND EVALUATION OF CU-MULUS MODIFICATION EXPERIMENTS, Virginia Univ., Charlottesville. Dept. of Environmental Sciences; and Virginia Univ., Charlottesville. Center for Advanced Studies. For primary bibliographic entry see Field 3B. W75-12105 EVALUATION BY MONTE CARLO TESTS OF EFFECTS OF CLOUD SEEDING ON GROWING SEASON RAINFALL IN NORTH DAKOTA, South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.

Rapid City. Inst. of Atmospheric Sciences. For primary bibliographic entry see Field 3B. W75-12106

BAYESIAN AND CLASSICAL STATISTICAL METHODS APPLIED TO RANDOMIZED WEATHER MODIFICATION EXPERIMENTS, Battelle-Northwest, Richland, Wash. For primary bibliographic entry see Field 3B. W75-1210F.

THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING. PART II: TECHNIQUES FOR THE PHYSICAL EVALUATION OF SEEDING.

Washington Univ., Seattle. Dept. of Atmospheric Sciences.

For primary bibliographic entry see Field 3B. W75-12108

THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING, PART III: CASE STUDIES OF THE EFFECTS OF SEEDING, Washington Univ., Seattle. Dept. of Atmospheric

Washington Univ., Scattle. Dept. of Atmospheric Sciences.

For primary bibliographic entry see Field 3B. W75-12109

POTENTIAL OF PRECIPITATION MODIFICA-TION IN MODERATE TO SEVERE DROUGHTS,

Illinois State Water Survey, Urbana. F. A. Huff, and R. G. Semonin. Journal of Applied Meteorology, Vol 14, No 5, p 974-979, August 1975. 2 fig, 5 tab, 9 ref. Bureau of Reclamation 14-06-D-7197.

Descriptors: *Weather modification, *Droughts, *Artificial precipitation, *Illinois, Feasibility, Cloud seeding, Precipitation(Atmospheric), Rainfall, Rainfall disposition, Climatology, Water supply, Mathematical models, Water shortage, Agriculture, Meteorology, Identifiers: Potential of weather modification.

Assuming that successful precipitation modification could be achieved under atmospheric condi-tions favorable for the development of natural precipitation, a three-phase study was made to acquire information on the potential for alleviation of moderate to severe droughts in Illinois. The first phase involved time-space analyses of monthly precipitation characteristics in previous major droughts of 12- to 24-month duration. In the second phase, detailed analyses were made of various storm properties during the 1953-54 drought, one of the worst on record in Illinois. The third phase involved use of a one-dimensional cloud model to investigate cloud seeding potential in the 1953-54 drought. Overall, results indicated that atmospheric conditions are favorable for natural precipitation development frequently enough in most droughts that successful cloud seeding operations could contribute occasionally to temporary alleviation of water shortages over portions of an extensive drought region, particularly with respect to agricultural needs. (Sims-ISWS) W75-12110

THE USE OF A MULTIZONE HYDROLOGIC MODEL WITH DISTRIBUTED RAINFALL AND DISTRIBUTED PARAMETERS IN THE NA-

TIONAL WEATHER SERVICE RIVER FORECAST SYSTEM,

National Weather Service, Slidell, La. Lower Mississippi River Forecast Center.

August 1975. 15 p, 4 fig, 3 tab, 6 ref.

Descriptors: "River forecasting, "Stream flow, "Rain gages, Floods, Rainfall, Hydrology, Rainfall intensity. Precipitation(atmospheric), Hydrography, Forecasting, Weather, Weather data, Precipitation intensity, Rainfall disposition, Parametric hydrology.

Parametric hydrology.

Identifiers: *Hydrological models, *Flood forecasting, *Rainfall distribution, *River forecast system, Streamflow simulation, Streamflow hydrologic models, Zonal precipitation, Convective rainfall, Distributed parameters, Parameters, Hydrologic surveys, Meteorological instruments.

Tests were conducted on a basin with a less-than-optimum rain gage network to evaluate the possibility of improving streamflow simulation through the use of zonal precipitation input and zonally varied parameters. Preliminary results for the 959-mi2, 4-zone watershed indicate that improved hydrograph reconstitution is obtained for rises caused by convective rains where the model parameters are adjusted to reflect hydrologic differences between upstream and downstream zones. The multizone approach used is model independent and should be valid for any conceptual hydrologic model employing a unit hydrograph to define the temporal distribution of runoff volumes. (NOAA)

ESTIMATION OF HURRICANE STORM SURGE IN APALACHICOLA BAY, FLORIDA,

National Weather Service, Silver Spring, Md. J. E. Overland.

NOAA Technical Report NWS 17, June 1975, 66p, 23 fig, 1 tab, 25 ref.

Descriptors: *Hurricanes, *Storms, *Storm surge, *Model studies, Tropical cyclones, Climatology, Meteorological data, Storm structure, Weather, Weather patterns, Climatic data, Hydrologic data, Wind velocity, Bayys, *Florida. Identifiers: *Hurrican storm surges, Hurricane storms, *Apalachicola Bay (Fla), Hurricane surges, Hydrodynamic model, Amplitude effects, Space variable wind velocities, Storm parameters, SPLAH computation, Hurricane parameters, Bay models.

A vertically integrated two-dimensional numerical hydrodynamic model is developed for simulation of hurricane surge in Apalachicola Bay. Standard explicit time differencing is used in conjunction with a single Richardson lattice. Model features include finite amplitude effects, space variable wind velocities, and parameterization of flooding of terrain, overtopping of barrier islands and flow through narrow passes. The model utilizes the results of C.P. Jelesnianski's SPLASH model computation for open coast surge as input seaward of the Bay and continues the same storm tract and wind field as used in the SPLASH computation across the Bay. The Bay model was calibrated for the astronomical tides and verified against hurricane Agnes. The response of Apalachicola Bay has been determined from numerical computations for a variety of hypothetical hurricanes as specified by various storm parameters. Surge heights in the Bay increase with hurricane central pressure depression in a nearly linear fashion as does the open coast surge. An important parameter is the duration that the open coast surge remains high, a function of the forward speed of the storm and, to a lesser extent, the radius of the maximum winds. (NOAA) W75-12164

Field 2—WATER CYCLE

Group 2B-Precipitation

INTERIM REPORT, PROBABLE MAXIMUM PRECIPITATION IN CALIFORNIA.

Bureau, Washington, Weather Hydrometeorological Section. Hydrometeorological Report No. 36, October 1961, 231 p.

Descriptors: Descriptors: *Precipitation(Atmosphene), *Probable maximum precipitation, *Rainf, Rainfall, Rainfall intensity, Snowfall, Climatology, Hydrology, Meteorology, Precipitation Intensity, Snowpacks, Storms, Weather, Weather data, Floods, Runoff forecasting, Flood forecasting, Flood control, Meteorological data, Climatic data, Pasine *California* *Precipitation(Atmospheric), Basins, *California.

Identifiers: Maximum precipitation, Precipitation levels, Precipitation forecasts, Precipitation probability, Rainfall forecasting, Rainfall probability, Precipitation storms, Orographic precipita-tion, Snowmelts, Snowmelt conditions.

The purpose of this report is to present criteria for estimating probable maximum precipitation over basins above prospective flood-control structures in the Pacific drainage of California. It includes sections on types and characteristics of major California precipitation storms; convergence probable maximum precipitation criteria; criteria for probable maximum orographic precipitation on windward slopes; criteria for probablle maximum spillover precipitation; combination of convergence and orographic probable maximum precipitation; checks on probable maximum precipitation; summary of steps in obtaining probable maximum precipitation for a basin; and temperature and wind criteria for snowmelt. (ETJA)

A STATISTICAL STUDY OF TROPICAL CYCLONE POSITIONING ERRORS WITH ECONOMIC APPLICATIONS,

National Hurricane Center, Coral Gables, Fla. J. Neumann.

NOAA Technical Memorandum NWS SR-82, March 1975. 21 p, 7 fig, 6 tab, 24 ref.

Descriptors: *Tropical cyclones, *Hurricanes, *Warning systems, *Monte Carlo method, Storms, Weather data, Weather, Climatology, Meteorology, Meteorological data, Forecasting, Weather forecasting, Coasts, Probability.

Identifiers: *Cyclones, Cyclone studies, Cyclone positioning errors, Hurricane forecasts, Hurricane studies, Hurricane landfall forecasts, Storm land-fall, Landfall forecasting, Hurricane warning zone, Coastal regions, Coastal hurricanes, Hur-ricane warning systems, Hurricane vectors, Control storms, Statistical studies.

Hurricane landfall forecasts are based heavily on the latest available motion vector and position of a storm. Inaccuracies in these data are closely related to errors in the time and place of storm land-fall. This study uses a Monte Carlo simulation of hurricane positioning errors to determine a statistical relationship between positioning errors and landfall errors. It is shown that for a typical 18-hour landfall forecast, approximately 22% of the landfall position error can be attributed to initial data uncertainties. It is further shown that a 20% increase in the size of a hurricane warning zone can be expected if the currently observed posioning errors are increased an average of 10 nmi. However, a 10 nmi decrease in positioning error yields only an 11% decrease in the size of the warning area. An economic analysis of potential changes in the size of hurricane warning areas is also shown. It is estimated that protection costs for a typical 300 nmi Gulf of Mexico coastal hurricane warning zone total \$25.1 million. A 10 nmi increase in positioning error will thus increase this loss by about \$5 million per storm. A 10 nmi decrease in positioning error will decrease protection costs by about \$2.75 million per storm. (NOAA) W75-12166

THE FLOOD OF APRIL 1974 IN SOUTHERN MISSISSIPPI AND SOUTHEASTERN LOUI-

National Weather Service, Washington, D.C. For primary bibliographic entry see Field 2E. W75-12170

2C. Snow, Ice, and Frost

FORMATION OF GRAUPEL, Naval Weapons Center, China Lake, Calif. For primary bibliographic entry see Field 3B. W75-12093

THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ART IFICIAL SEEDING. PART I: NATURAL CON-

Washington Univ., Seattle, Dept. of Atmospheric Sciences.

For primary bibliographic entry see Field 3B. W75-12096

A PRELIMINARY STUDY OF THE FORMA-TION OF LANDFAST ICE AT BARROW, ALASKA, WINTER 1973-74,

Alaska Univ., College. Geophysical Inst L. H. Shapiro.

June 1975, Report No. UAG R-235 and No. 75-7. 44 p, 14 fig, 2 ref. NOAA Grant No. 04-3-158-41.

Descriptors: *Ice, *Ice cover, *Frozen ground, *Permafrost, *Ice-water interfaces, Mapping, Topographic mapping, Environment, Oceanog-raphy, Climatology, Hydrologic data, On-site in-vestigations, On-site data collections, *Alaska. Identifiers: *Landfast ice, Ice formations, Barrow(Alaska), Pack ice, Ice maps, Ice dynamics, Hummock fields, Ice drift, Pressure ridges, Shear ridges, Ice studies, Topographic features, Artic

During late December 1973, the landfast ice sheet at Barrow broke loose and drifted offshore, following which an intense storm drove the pack ice into the nearshore zone. As a result, a new land-fast ice mass was formed, which included a complex array of pressure ridges, shear ridges and hummock fields. The entire process was monitored by radar, and this report provides information on the velocity vector of the pack ice during this time, and on the sequence of events which lead to the formation of the landfast ice. This data, in conjunction with field observations, gives some insight into the mechanisms by which some of the structural features of the landfast ice mass were formed. An important feature of the landfast ice was a linear hummock field about 4 km long, 135 m wide, and with an average elevation of about 3 m. On its offshore side, this 'ice pile' was bounded by a shear ridge which built shortly after the pile under the same conditions of ice drift. The formation of both these features took less than 1.5 hours, and the transition between them is hypothesized to have resulted from the change in ater depth along the outer boundary of the shoal. (NOAA) W75-12162

INTERIM REPORT, PROBABLE MAXIMUM PRECIPITATION IN CALIFORNIA.

Weather Bureau. Washington Hydrometeorological Section. For primary bibliographic entry see Field 2B. W75-12165

MAJOR LATE-WINTER FEATURES OF ICE IN NORTHERN BERING AND CHUKCHI SEAS AS DETERMINED FROM SATELLITE IMAGERY, Alaska Univ., College. Geophysical Inst. L. H. Shapiro, and J. J. Burns. Sea Grant Report No. 75-8, June 1975. 16 p, 9 fig. NOAA Grant No. 02-3-158-41.

Descriptors: *Ice, *Sea ice, Hydrographic analysis, Iced lakes, Oceanography, Marine geology, Satellites(artificial), Alaska, Artic Ocean, Remote reusing

Identifiers: *Bering Sea, *Chukchi Sea, *Ice formation, Meteorological satellites, Sea ice movements, Sea ice formation, Satellite imagery, Geophysical data, Ice drift, Coastal ice, Shear zones, Pack ice, Spaceborne photography, Geophysical surveys.

Imagery from the ERTS-1, DAPP AND NOAA 2/3 VHRR satellite systems were used for identification of recurring features of the movement and distribution of sea ice in the Bering and Chukchi seas during late winter. Data acquired during March and April of 1973 and 1974 show several such features including: (1) a shear zone of variable width along the west coast of Alaska which separates landfast ice from drifting sea ice; (2) an area of generally broken pack ice between Bering Strait and Point Hope; (3) persistent polynya off south-facing coasts, such as that east of Point Hope, south of the Seward and Chukchi Peninusla and south of the larger islands; (4) convergence zones on the north sides of St. Lawrence and Nunivak Islands, and (5) narrow shear zones extending generally southward from the boundaries of Bering Strait and from the east and west ends of St. Lawrence Island. The pattern observed is consistent with a general southward drift of sea ice under the influence of the prevailing northerly winds. Closure of ice against south-facing coasts, reflecting northward ice drift, occurred about 10% of the time. These episodes probably correlate cither with short periods of dominately south winds or drift under the influence of north setting currents when prevailing north winds were light. (NOAA) W75-12168

2D. Evaporation and Transpiration

HYDROLOGICAL STUDIES OF EVAPOTRANS-PIRATION AND GROUNDWATER FLOW IN SANDY LAND,

National Research Inst. of Agricultural Engineering, Hiratsuka (Japan).

In: Systems Approach to Hydrology: Proceedings in. Systems Apploach to Hydrology, Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 444-452, 1971. 5 fig.

Descriptors: *Evapetranspiration, *Groundwater, Dunes, Sand aquifers, Sands, Hydrologic cycle, Infiltration, Lysimeters, Transpiration, Sea water, Impervious soils, Percolation, Water balance, Hydrology, Equations. Identifiers: *Japan, *Hiratsuka City, Sandy soil.

Groundwater flow from 1953 through 1965 in an almost flat coastal sand dune located 60 km southwest of Tokyo and 3.5 km inland was discussed. Because of the sandy soil, all precipitation infiltrated into the ground and there was no surface runoff. Soil moisture, groundwater level, and evapotranspiration were measured and meteorological observations were made. During the 13 years of record, the population increase and development of industry caused a rapid increase of pumpage. Water levels declined and the unconfined groundwater table lowered because of percolation into deeper strata. Transpiration was esti-mated using precipitation, groundwater flow, groundwater stage, and the relationship between groundwater level and its drawdown corresponding to change in environments. Evapotranspiration indirectly obtained by water balance calculation was more reliable than direct measurements with lysimeters. The rater of groundwater lowering in-creased with time, rising after rains but generally

Streamflow and Runoff-Group 2E

declining 400 cm by 1965. (See also W75-12014) (Roberts-ISWS) W75-12032

VARIATIONS OF THE TURBULENT FLUXES OF MOMENTUM, HEAT AND MOISTURE OVER LAKE ONTARIO,

Atmospheric Environment Service. Toronto (Ontario)

For primary bibliographic entry see Field 2H. W75-12078

THE SPATIAL AND TEMPORAL VARIATIONS OF THE TURBULENT FLUXES OF HEAT, MO-MENTUM AND WATER VAPOR OVER LAKE ONTARIO.

National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lahs

B. R. Bean, C. B. Emmanuel, R. O. Gilmer, and R.

E. McGavin. Journal of Physical Oceanography, Vol 5, No 3, p 532-540, July 1975. 11 fig. 2 tab, 9 ref.

Descriptors: *Evaporation, *Lake Ontario, *Turbulent flow, *Variability, Heat, Momentum transfer, Water vapor, Winds, Temperature, Time series analysis, Aircraft, Spectroscopy, Fetch, Upwelling.

Identifiers: Polar continental outbreaks, Instrumented aircraft, Gust probe, Turbulent flux, Eddy correlation, Sensors, Convergence zone.

During the 1972 International Field Year for the Great Lakes 'alert' periods, the NOAA/RFF/DC-6 gust probe instrumented aircraft was used to record time series of wind, temperature, and water vapor at heights ranging from 18 to 300 m above the surface of Lake Ontario. The time series the surface of take Ontaino. The unle series records showed great variability. This was especially the case of evaporation when, in the fall, polar continental outbreaks moved across the lake. Such an outbreak of cold dry air moved across the lake at 12-15 m/s on October 9, 1972. This resulted in a drop of the air temperature at 30 m above the lake from 12 to 6 degrees C, while the evaporation rate increased to more than 1 cm/day. This may be compared to the 0.5 cm/day typical evaporation rate observed in the tropics during BOMEX. Furthermore, infrared lake surface temperatures showed cold regions (5C) along the north shore, presumably due to strong upwelling, while the center and south shore regions of the lake were of the order of 12-15 degrees C. The turbulent flux quantities of momentum, heat, and water vapor were obtained by the eddy correlation technique and their spectra were determined at several locations over the lake surface for 3-minute sampling lengths. At the aircraft speed of 92 m/s this represented a flight path of about 17 km. The spectra demonstrated the tendency for the peak value to march to longer wavelengths with increasing height. (Roberts-ISWS) W75-12079

DIURNAL AND SEASONAL SOIL WATER UP-TAKE AND FLUX WITHIN A BERMUDAGRASS ROOT ZONE,

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.

R. C. Rice.

Soil Science Society of America Proceedings, Vol 39, No 3, p 394-398, May-June 1975, 9 fig, 2 tab, 9

Descriptors: *Evapotranspiration, *Soil water, Descriptors: "Evapotranspiration, "Soil water, "Unsaturated flow, "Hydraulic conductivity, Bermudagrass. Lawns, Water utilization, Root zone, Consumptive use, Irrigation, On-site in-vestigations, Soil water movement, Soil moisture, Subsurface flow, Vegetation, Diurnal, Seasonal, Pressure head, Tensiometers. Identifiers: "Water uptake. Diurnal water movement within a bermudagrass root zone and the uptake of water by the roots was studied in a field plot. A fast response tensiometerpressure-transducer system was used to measure the hydraulic head. The relations of pressure head to water content and to hydraulic conductivity were determined in situ. Diurnal water content and soil water flux profiles were derived by using the established hydraulic properties. The fast response tensiometer system enabled calculation of flux and water content changes over 2-hour intervals. Diurnal water extraction rates calculated for different depths and times during the growing season yielded evapotranspiration rates that agreed well with rates measured on similar days in previous years using a lysimeter. The water uptake pattern changes rapidly near the surface during the first few days after irrigation. Rewetting within the soil profile occurred in late afternoon at depths where upward gradients were present. The seasonal consumptive-use curve can be estimated from several daily evapotranspiration rates calculated during the growing season. (Sims-ISWS) W75-12082

2E. Streamflow and Runoff

A PARTICULAR COMPARISON OF ANNUAL MAXIMA AND PARTIAL DURATION SERIES METHODS OF FLOOD FREQUENCY PREDIC-

Institute of Hydrology, Wallingford (England). C. Cunnane.

Journal of Hydrology, Vol. 18, No. 3/4, p 257-271,

March, 1973. 1 fig, 9 ref.

Descriptors: *Hydrologic aspects, *Flood forecasting, Flood frequency, Mathematical stu-

A method for comparing the statistical efficiency of the estimate of the T year flood, Q(T), by two different methods has been developed. On the basis of commonly used assumptions it is shown that for return periods greater than about T = 10 years, the annual exceedance series estimate of Q(T) has larger sampling variance than the annual maxima series estimates. For the same range of return periods, the partial duration series estimate of Q(T) has smaller sampling variance than the annual maxima series estimate only if the partial duration series contains at least 1.65 N items, where N is the number of years of record. (Sandoski-FIRL) W75-11929

FLOOD EVENT DATA COLLATION, Institute of Hydrology, Wallingford (England). For primary bibliographic entry see Field 7C.

FLOOD PROFILES IN THE UMPQUA RIVER BASIN, OREGON: PART 3, UMPQUA RIVER BELOW SCOTTBURG, SCHOLFIELD, COW CREEK ABOVE GLENDALE,

Geological Survey, Portland, Oreg. For primary bibliographic entry see Field 4A. W75-11959

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS - VOLUME 3. BASINS FROM APALACHICOLA RIVER TO PEARL RIVER. GORDERIES SURFIELD FOR TO.

Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 6. MISSOURI RIVER BASIN--VOLUME 1. MISSOURI RIVER BASIN ABOVE WILLISTON, NORTH DAKOTA. Geological Survey, Reston, Va.

For primary bibliographic entry see Field 7C. W75-11968

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIP-PI RIVER--VOLUME 2. ARKANSAS RIVER

Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-11969

STOCHASTIC HYDROLOGIC SYSTEMS, Illinois Univ., Urbana, Dept. of Hydraulic Engineering. For primary bibliographic entry see Field 2A. W75-12015

TRANSFORMATION SYSTEM IN FLOOD RU-NOFF PHENOMENA, Kyoto Univ. (Japan). Dept. of Civil Engineering.

T. Ishihara, and T. Takasa

In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 24-50, 1971. 7 fig. 3 tab, 15

Descriptors: *Flood flow, *Rainfall, *Soil horizons, *Hydraulic systems, *Hydrologic aspects, *Runoff, Soil moisture, Mathematical models, Infiltration, Roughness coefficient, Over-land flow, Dynamics, Watersheds(Basins), Peak discharge, Discharge(Water).

Identifiers: *Runoff dynamics, Nonlinearity of runoff, Transformation system.

The storm runoff during a flood was described as a transformation system from rainfall to discharge. Three fundamental patterns exist in runoff process and their characteristics are mainly determined by the nonlinearity and the variation properties of the area where runoff occurs. The characteristics of each pattern were analyzed, the transformation operator from rainfall to runoff was presented. and the significance of the nonlinearity of runoff was discussed in terms of system dynamics. Overwas discussed in terms of system dynamics. Overland and subsurface flows were considered as affected by the properties of the A-layer or the surface substratum. The results presented are applicable to basin sizes of a few hundred square miles. For larger basins, the problems of flood routing and dispersion of the flood wave still await solution. (See also W75-12014) (Singh - ISWS) W75-12016

NONLINEAR RUNOFF KERNELS HYDROLOGIC SYSTEM,
Tokyo Inst. of Tech. (Japan). Dept. of Civil En-

gincering. For primary bibliographic entry see Field 2A. W75-12019

KERNELS OF STOCHASTIC LINEAR HYDROLOGIC SYSTEMS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W75-12021

THE STOCHASTIC KINEMATIC WAVE, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12023

SYSTEMS SIMULATION OF STREAMFLOWS. Kyoto Univ., (Japan), Dept. of Civil Engineering. Y. Iwasa, K. Inoue, and Y. Tsunematsu. In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S. Japan Seminar in Hydrology, Hawaii University, Honolulu, January

Field 2-WATER CYCLE

Group 2E-Streamflow and Runoff

11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 226-245, 1971. 5 fig, 1 tab, 8 ref.

Descriptors: "Mathematical models, "Flood routing, "Simulation analysis, Hydrology, Open channel flow, Storage, Hydraulies, Streamflow. Identifiers: "Lax-Wendroff scheme, "One-dimensional analysis, "Kinematic wave theory, Method of characteristics.

Basin runoff hydrology was modeled by mathematical simulation of overland and streamflows. Mathematical formulation of streamflow behavior by one-dimensional methods of hydraulic analysis and its use in streamflow simulation was dealt with. The simulation technique consisted of a mathematical model of channel reaches and applying flood routing procedures. A classification of model approximations in the system and their hydraulic role in mathematical expressions was described. The models were evaluated under idealized conditions to give physical significance to the channel storage in terms of channel geometry. (See also W75-12014) (Lardner-ISWS)

EFFECTS OF MOVEMENT OF PRECIPITA-TION AREA UPON RUNOFF PHENOMENA, Tokyo Univ., (Japan). Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W75-12026

A BAYESIAN FRAMEWORK FOR THE USE OF REGIONAL INFORMATION IN HYDROLOGY, Resource Analysis, Inc., Cambridge, Mass. For primary bibliographic entry see Field 6A. W75-12048

1974 WATER RESOURCES DATA FOR OREGON, SURFACE WATER RECORDS, Oregon State Engineers Office, Salem. Water

Resources Dept.
For primary bibliographic entry see Field 7C.
W75-12087

THE USE OF A MULTIZONE HYDROLOGIC MODEL WITH DISTRIBUTED RAINFALL AND DISTRIBUTED PARAMETERS IN THE NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM, National Weather Service, Slidell, La. Lower Missierie Flue Ferrer Centers

National Weather Service, Slidell, La. Lower Mississippi River Forecast Center. For primary bibliographic entry see Field 2B. W75-12159

COOK INLET TIDAL STREAM ATLAS, Inst. of Marine Science. Alaska Univ., College. For primary bibliographic entry see Field 21.. W75-12163

A STUDY OF FLASH-FLOOD SUSCEPTIBILITY

— A BASIN IN SOUTHERN ARIZONA,
National Weather Service, Salt Lake City, Utah.
Western Region.
For primary bibliographic entry see Field 4A.
W75-12167

THE FLOOD OF APRIL 1974 IN SOUTHERN MISSISSIPPI AND SOUTHEASTERN LOUI-SIANA, National Weather Service, Washington, D.C.

National Weather Service, Washington, D.C. E. H. Chin. Technical Memorandum NWS HYDRO-24, Au-

Technical Memorandum NWS HYDRO-24, Agust 1975. 45 p, 16 fig, 4 tab, 13 ref.

Descriptors: *Floods, *Flooding, *Flood data, *Flood damage, *Precipitation excess, Flash floods, Historic floods, Flood discharge, Precipitation(Atmospheric), Weather patterns, Rainfall intensity, Climatology, Storms, Squalls, *Mississippi, *Louisiana.

Identifiers: *Pascagoula River basin, *Pearl River basin, Storm precipitation, Precipitation, Precipitation distribution.

The flood of April 1974 over the Pascagoula and Pearl River Basins in southern Mississippi and southeastern Louisiana ranks among the most severe in terms of crest stages and maximum flood discharge reached. The objectives of this report are to present the meteorological events assoicated with the flood, in particular the precipitation distribution, and to give a concise account of the flood itself. Emphasis will be placed on events in southern Mississippi, where heaviest storm precipitation fell and where flooding was most severe. This flood was mainly the result of a storm that covered Louisiana, Mississippi, and western Alabama on April 11-15, 1974. Significant incur-sion of tropical maritime air mass into the region occurred prior to and during the storm. The broad synoptic-scale situation associated with the precipitation was an occluded Low centered over the Midwest together with its frontal system. The major portion of the storm precipitation, however, was due to mesoscale squall line severe storms that developed in the moist environment of the warm sector ahead of the front. Amounts exceeding the 100-yr rainfall were observed at some places in southern Mississippi and at least one site in Louisiana. (NOAA) W75-12170

A STUDY OF FLASH-FLOOD OCCURRENCES AT A SITE VERSUS OVER A FORECAST ZONE,

National Weather Service, Salt Lake City, Utah. Western Region.

Gerald Williams. NOAA Technical Memorandum NWS WR-100, August 1975, 16 p.

Descriptors: *Flood forecasting, *Flash floods, *Floods, *Flooding, *Flood data, *Maximum probable flood, Flood control, Hydrology, River forecasting, Warning systems, Flood plains, Flood recurrence interval, Weather forecasting, Meteorological data, Rainfall, Forecasting, Rainfall intensity.

Identifiers: Flash flooding, Flash flood studies, Flood studies, Flood occurrences, Flood occurrences, Meteorological forecasting.

Some relations are described between probability of point rainfall amounts and probability of the same amounts falling some place within an area; i.e., point probability vs. areal probability of flash-flood occurrences at sites and the probability of flash-flood occurrences at sites and the probability of flash-flood occurrences somewhere within a forecast zone are also developed. The paper considers and examines unusually heavy rainfall of short duration from convective activity and its closely related partner, flash-floods. Some of the conclusions drawn from the study are that the 100-year 1/2-hour amount of point rainfall probably may occur once every several years somewhere on a 60-square-mile basin. Flash-flood occurrences appear to exhibit similar relationships but over larger areas. Errors in verification of flash-flood watches and warnings may occur when only known flash-flood occurrences are used. Forecast verification may improve if all events are made known and enhancement of accuracy in forecast procedures is probable. (NOAA)

FLOOD PLAIN INFORMATION: FOUNTAIN CREEK, COLORADO SPRINGS, MANITOU SPRINGS, COLORADO.

Army Engineer District, Albuquerque, N. Mex. Prepared for the Pikes Peak Area Council of Governments, August, 1974. 44 p, 9 fig, 16 plates, 5 tah Descriptors: *Flood plains, *Flood damage, *Flood plain zoning, *Flood profiles, *Flood data, Land use, Planning, Historic floods, Obstruction to flow, *Colorado, Flood forecasting, Flood proofing. Identifiers: Fountain Creek(Colo). Colorado

proteing: Fountain Creck(Colo), Colorado Springs(Colo), Manitou Springs(Colo), Flood plain management, Intermediate Regional Flood, Standard project flood, Pikes Peak(Colo), Subdivision regulations.

Fountain Creek, a perennial stream with head-waters fed by glacial snowpacks and springs, rises in the mountains near Pikes Peak, flows through a narrow steep walled canyon. In the upper part of the study area of 120 sq mi, stream slope averages about 90 ft/mi and the valley width averages 400 ft; in the lower part about 63 ft/mi with average valley width of 600 ft. Flood plain is narrow with extensive residential commercial, and tourist development. Flood producing storms occur from May to August when maximum contrast in temperature ses heaviest precipitation. Even more intense rainfall from cloudbursts occurs during July and August. Historical documents and newspaper files give information on past floods which have caused extensive damage. Obstruction to flow is created by 31 bridges, including numerous footbridges and other planked crossings which can be expected to wash downstream. Highest peak discharge in the study reach produced by an Intermediate Regional Flood (IRF) would be 20,500 cfs and by a Standard Project Flood(SPF) 34,000 cfs. At the same location of the standard Project Flood (SPF) 34,000 cfs. tion, main channel velocity of an IRF would be 13.1 feet per second and of a SPF, 15.4 feet per second. Both an IRF and a SPF would cause severe damage to Colorado Springs and Manitou Springs, neighboring communities on Fountain Crook Both cities have appeared to the Creek. Both cities have enacted subdivision regu-lations that could be the foundation of effective management. (Diefendorf-North flood plain Carolina) W75-12372

FLOOD PLAIN INFORMATION: TONAWANDA CREEK AND ITS AFFECTED TRIBUTARIES, ERIE AND NIAGARA COUNTIES, NEW YORK. Army Engineer District, Buffalo, N. Y.

Prepared for Erie-Niagara Basin Regional Water Resources Planning and Development Board, August, 1967. 86 p., 46 fig., 14 plates, 18 tab.

Descriptors: Floods, *Flooding, *Flood control, *Flood plains, Water management(Applied), *New York State Barge Canal, *New York, Flood protection.

Identifiers: *Tonawanda Creek(New York), Eric County(New York), Niagara County(New York), Intermediate Regional Flood, Standard Project Flood

Flooding along Tonawanda Creek and its tributaries from its confluence with the Niagara River to the easterly limit of Eric and Niagara Conties in western New York state, a distance of 41.5 creek miles, is examined. The lower reach is navigable with very flat channel gradients. Most of the flood plain is agricultural, with scattered residences. Overflow from the narrow winding obstructed channel can occur at all times of year, although major floods occur in the late winter and early spring from snow melt and moderate rainfall. Flood flows in lower reaches are modified by abundant overbank storage. In the upper reaches, flooding is of long duration. There are no existing or authorized flood control projects within the study area, and, with the exception of the town of Royalton, none of the communities have flood plain regulations. The largest flood at Alabama, New York, occured January 23, 1959, cresting at 16.0 feet due to ice jams, with peak discharge of 6550 cfs. The March 1960 flood crested at 14.3 feet with peak discharge of 7980 cfs, its impact lessened by removal of an old dam and improvement of the Eric Barge Canal. An Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) would have peak discharges of 11,500 cfs and

Groundwater-Group 2F

35,200 cfs, respectively. In the Tonawanda Creek Reach between Rapids, New York and the Erie-Reach between Rapids, New York and the Erichalagara and Genessee County line which sustained the most damage and widespread flooding along the creek in 1960, an IRF would cause flooding to be over 1 foot deeper and the SPF 2 feet deeper than 1960 in this area. (Salzman-North Complian) W75-12373

2F. Groundwater

DISPLACEMENT STABILITY OF WATER DRIVES IN WATER-WET CONNATE-WATER-BEARING RESERVOIRS,

Koninklijke-Shell Exploratie en. Laboratorium, Rijswijk (Netherlands). Produktie For primary bibliographic entry see Field 4B. W75-11870

GEOHYDROLOGY OF COLLIER COUNTY,

FLORIDA, Dames and Moore, Park Ridge, Ill. For primary bibliographic entry see Field 4B. W75-11874

GEOCHEMISTRY OF OIL-FIELD WATER AP-PLIED TO EXPLORATION, Bureau of Mines, Bartlesville, Okla. Bartlesville

Energy Research Center. For primary bibliographic entry see Field 4B. W75-11879

DECIPHERING OF GROUND WATER FROM AERIAL PHOTOGRAPHS.

For primary bibliographic entry see Field 4B.

INNOVATIVE WORKOVER FOR WASSON WATER WELLS,

For primary bibliographic entry see Field 3B. W75-11890

LAND SUBSIDENCE IN THE SAN JOAQUIN VALLEY, CALIFORNIA, AS OF 1972, Geological Survey, Reston, Va.

For primary bibliographic entry see Field 4B. W75-11956

LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA, PART 2. SUBSIDENCE AND COMPACTION OF

DEPOSITS, Geological Survey, Reston, Va. For primary bibliographic entry see Field 4B. W75-11957

LAND SUBSIDENCE DUE TO GROUND-LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA, PART 3. INTERRELATIONS OF WATER-LEVEL CHANGE, CHANGE IN AQUIFER-SYSTEM THICKNESS, AND SUBSIDENCE, Geological Surray, Page 19, Va. Geological Survey, Reston, Va. For primary bibliographic entry see Field 4B. W75-11958

GROUND-WATER BASIC DATA FOR EMMONS COUNTY, NORTH DAKOTA, Geological Survey, Bismarck, N. Dak. For primary bibliographic entry see Field 4B. W75-11963

ARTIFICIAL GROUNDWATER RECHARGE, I. CIRCULAR RECHARGING AREA, California Univ., Davis. Dept. of Water Science and Engineering.

For primary bibliographic entry see Field 4B.

GEOCHEMISTRY OF STRONTIUM IN THE SCIOTO RIVER DRAINAGE BASIN, OHIO, Miami Univ., Oxford, Ohio. Dept. of Geology For primary bibliographic entry see Field 2K W75-12052

DIURNAL FLUCTUATIONS OF WATER TA-BLES INDUCED BY ATMOSPHERIC PRES-SURE CHANGES,
Texas Univ. at Austin. Dept. of Geological

Sciences. For primary bibliographic entry see Field 2G. W75-12077

ENVIRONMENTAL OF METHODS AS A RECONNAISSANCE TOOL IN GROUNDWATER EXPLORATION NEAR SAN ANTONIO DE PICHINCHA, ECUADOR,

Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie. H. Moser, and W. Stichler.

Water Resources Research, Vol 11, No 3, p 501-505, June 1975, 3 fig. 5 ref.

Descriptors: *Groundwater recharge, *Isotope studies, *Deuterium, *Water sources, *Exploration, *Tritium, Groundwater, Springs. Areal hydrogeology, Surveys, Recharge, Subsur-face waters, Semiarid climates, Meteorolotical data, Discharge(Water), Natural recharge, Hydrology, Basins, Spring waters, Radioisotopes, Stable isotopes.

Identifiers: *Ecuador, *Reconnaissance tool,

Identifiers: *Oxygen 18.

In a semiarid area in the Sierra of Ecuador (about 20 km north of Quito), measurements of deuterium, oxygen 18, and tritium content in spring water, surface water, and precipitation were performed. The results, together with some meteorological and hydrogeological data, furnished information on the recharge area and on the recharge rate of groundwater. On the basis of the results, a groundwater exploitation does not appear feasible. (Prickett-ISWS) W75-12080

ARTIFICAL GROUNDWATER RECHARGE, II. RECTANGULAR RECHARGING AREA, California Univ., Davis. Dept. of Water Science

and Engineering.
For primary bibliographic entry see Field 4B.
W75-12097

METHOD OF CLEANING AND STIMULATING A WATER WELL, For primary bibliographic entry see Field 3B.

W75-12301

FLUID FLOW IN CHANNELS, CAPILLARIES, AND POROUS MEDIA UNDER THE IN-FLUENCE OF AN ELECTRIC FIELD, Bureau of Mines, Morgantown, W. Va. Petroleum

Research Lab. Research Lab.
L. C. Headley, C. I. Pierce, and W. K. Sawyer.
Report of Investigations 7342, January, 1970. 33 p.
15 fig, I tab, 24 ref.

Descriptors: Flow, *Electrochemistry, Physical properties, Porous media, Capillary, Conductivity, Aquifer characteristics, *Electric fields, Oil Industry, *Flooding(Oil Recovery).

A series of exploratory tests was conducted to determine the effects of steady electric fields on fluid flow and streaming potential in narrow passages and porous media, the effects of steady electric fields on fluid interfaces, and the influence

of internal voltages on fluid flow in a porous por-celain sample. Voltages greater than about 5 kilovolts were found to influence liquip droplets emanating from a capillary tube. Solutions of polyethylene oxide and polyacrylamide in water exhibited widely different behavior than that of other liquids tested. Liquid-liquid displacement tests in porous samples to determine the influence of high voltage applied to the displacing liquid on flow rates and recovery gave no significant differences. No consistently measurable effects were noted, either on flow rate or streaming potential. when an electric field was applied transverse to the direction of flow in porous media and in nar-row rectangular or cylindrical channels. Experimental values of formation factor and streaming potential for a porous porcelain sample agreed potential for a porous porcelain sample agreed qualitatively with those calculated from elec-trokinetic theory for ultrafine capillaries. How-ever, the agreement for the electroviscous effect was not good. (Campbell-NWWA) W75-12381

GROUND WATER AND GROUND-WATER CONTROL.

For primary bibliographic entry see Field 4B. W75-12386

BACTERIAL PROCESSES FOR IMPROVED OIL RECOVERY.

Tulsa Univ., Okla. I R Frick

Journal of Petroleum Technology, Vol. 24, p 1469-1470, December, 1972, 12 ref.

Descriptors: *Bacteria, Oil, *Clostridium, *Oil spills, *Oil pollution, Oil industry, Oil reservoirs, Clogging, Permeability, Identifiers: *Desulfovibria hydrocar-

bonoclasticus. Water-thickening agents, recovery

Bacteriological oil recovery is reviewed from its first application in 1946. At that time, the bacteria, Desulfovibria hydrocarbonoclasticus, and acrobe, was injected into an oil producing formation to increase recovery. The four mechanisms of oil release are: (1) production of gaseous carbon dioxide, (2) production of organic acids and detergents, (3) dissolution of carbonates in the rock, and (4) physical dislodgement of the oil. Bacteria of the Clostridium type have been isolated. They reduce heavy hydrocarbons in place to form lighter fractions and gases. Bacteria might also be used for selective plugging in wells. Another possible application is in the underground production of water-thickening agents. (Bradbeer-NWWA) W75-12391

STUDIES IN THE SYSTEM CACO:-FECO3: 1. PHASE RELATIONS; 2. A METHOD FOR MAJOR-ELEMENT SPECTROCHEMICAL ANALYSIS; 3. COMPOSITIONS OF SOME FER-

ROAN DOLOMITES, Chicago Univ., Dept. of Geophysical Sciences. J. R. Goldsmith, D. C. Graf, J. Witters, and D. A. Northrop.

Journal of Geology, Vol 70, No 6, p 659-687, November, 1962. 11 fig, 10 tab, 15 ref.

Descriptors: *Dolomite, *Calcite, *Diagenesis, *Phase diagrams, Geochemistry, Thermal proper-ties, McIting, Pressure, Liquids, Gases, Geology, Sedimentology, Ground water. Identifiers: *Magnesite, *Siderite.

Isothermal sections at 600, 650, 700, 750 and 800C, run for the most part at 15 kilobars total pressure, run for the most part at 15 kilobars total pressure, were obtained using a squeezer-type apparatus. Above approximately 675C the system contains two two-phase and two single-phase areas. A three-phase area in the Mg-poor portion of the system is first detected at 675C and becomes progressively larger at 650C and 600C. Ferroan dolomite, ferroan- magnesian calcite, and calcian-

Field 2-WATER CYCLE

Group 2F-Groundwater

magnesian siderite coexist in this three phase triangle. The hypothetical compound CaFe (CO3)2, not known in nature, lies in a two-phase field even at 800°C. The maximum FeCO3 substitution observed in twenty naturally occurring ferroan dolomites examined is 31% mol, essentially the same as the maximum equilibrium substitution achieved experimentally. Natural ferroan dolomites may be metastable compositionally, therefore the FeCO3 content cannot be used for geological thermometry. A spectrochemical method is described which determines mo1% with small root mean square relative errors. (Bradbeer-W75-12400

HYDROGEOLOGIC DATA FOR THE LOWER CONNECTICUT RIVER BASIN, CONNEC-

Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C. W75-19954

2G. Water In Soils

FUNGUS DISEASES OF WHEAT ON IR-RIGATED LANDS. (IN RUSSIAN), Volgograd Agricultural Inst. (USSR)

For primary bibliographic entry see Field 21.

EVALUATING THE PRODUCTIVITY OF PINE FORESTS IN THE HINTON-EDSON AREA, ALBERTA, FROM SOIL SURVEY MAPS, Department of Agriculture, Ottawa (Ontario). Soil

Research Inst. For primary bibliographic entry see Field 4A. W75-12003

NUMERICAL SIMULATION OF WATERSHED HYDROLOGY,

Texas Univ., at Austin. Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W75-12027

EFFECT OF HYSTERESIS ON THE PREDIC-TION OF INFILTRATION, REDISTRIBUTION AND DRAINAGE OF WATER IN A LAYERED

New Mexico State Univ., University Park. Dept. of Agronomy.

J. H. Dane, and P. J. Weirenga. Journal of Hydrology, Vol 25, No 3/4, p 229-242, May 1975. 18 fig, 2 tab, 18 ref.

Descriptors: *Soil water, *Hydraulic conductivity, Descriptors: 'Son water, 'Hydraunic conductivity, 'Hysteresis, 'Computer models, Moisture ten-sion, 'Infiltration, Drainage, Tensiometers, Dar-cys law, Irrigation, Sands, Drying, Wetting, Moisture content, Soil water movement. Identifiers: 'Soil columns, Drying curves, Wetting

In order to study the effect of hysteresis on soil water movement, a large soil column filled with Glendale clay loam over a river sand was flood-irrigated with 10 cm water. The infiltration rate, wetting front advance, water content redistribution, and amount of drainage water were measured. A computer model was developed to simulate the flow behavior. The main drying and main wetting curves in the relationship between soil water tension and water content and in the relationship between hydraulic conductivity and water content were provided in the computer model. From these relationships, scanning curves were developed to simulate hysteretic flow behavior under both wetting and drying conditions. Experi-mental data were compared with data computed from either the main drying, the main wetting, or the scanning curves. Infiltration was accurately predicted using the main wetting curves. How

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ever, redistribution and drainage were better predicted when hysteresis was taken into account. (Schicht-ISWS)

MATHEMATICAL ANALYSIS OF STEADY SATURATED FLOW THROUGH A MUL-TILAYERED SOIL WITH A SLOPING SUR-FACE.

Florida Univ., Gainesville. Dept. of Soil Science. H. M. Selim, M. S. Selim, and D. Kirkham Soil Science Society of America Proceedings, Vol 39, No 3, p 445-453, May-June 1975. 12 fig, 3 tab, 16 ref. NSF Grant GK-31137.

Descriptors: *Saturated flow, *Seepage, *Slopes, *Infiltration, Potential flow, Saturated soils, Soil water movement, Mathematical studies, Mathematical models, Model studies, Hydraulic conductivity, Permeability, Soil water, Groundwater movement, Groundwater potential, Flow, Soils. Identifiers: Multi-layered soils.

An analytical solution was presented for a twodimensional multilavered hillside problem. The soil was horizontally stratified with each layer having a different permeability. The flow medium was assumed to be water-saturated to the soil surface, bounded below by an impermeable barrier at a finite depth, and bounded laterally by vertical streamlines. Seepage occurred into the flow medium along the upper part and out along the lower part of the sloping soil surface. Two situations were analyzed, one with a constant slope soil surface and another with an abritrarily shaped soil surface. The potential and stream functions for the problem were developed by starting with a general series solution to Laplace's equation and using a medified Gram-Schmidt method to determine the series coefficients. Solu-tions were derived for two-layered and threelayered soils. From these derivations, solutions for soils with more than three layers could be readily deduced. The results presented include flow nets, seepage velocities, and infiltration rates for twolayered and three-layered soils. (Sims-ISWS)

A THERMODYNAMIC INTEGRAL EQUATION FOR THE EQUILIBRIUM MOISTURE PROFILE IN SWELLING SOIL.

Arizona Water Resources Research Center, Tuc-G. Sposito

Water Resources Research, Vol 11, No 3, p 499-500, June 1975. 10 ref. OWRT A-055-ARIZ(3).

Descriptors: *Soil moisture, *Thermodynamics, *Equilibrium, *Equations, Solutes, Profiles, Water table, Entropy, Temperature, Bulk density, Porous media.

Identifiers: *Swelling soil, *Gravichemical potential, Soil-water-air system, Moisture profile.

The methods of thermodynamics were employed to develop a nonlinear integral equation for the equilibrium moisture profile in a swelling soil which was assumed to be uniform in the distribution of dissolved substances. The equation was shown to be identical with an expression suggested (but not derived) by Philip in response to criticism of his discussion of the hydrostatics of swelling porous media. (Visocky-ISWS) W75-12050

INFLUENCE OF SOIL WATER MATRIC POTENTIAL AND RESISTANCE TO PENETRA-TION ON CORN ROOT ELONGATION. For primary bibliographic entry see Field 3F. W75-12055

DIUDNAL PLUCTUATIONS OF WATER TA. BLES INDUCED BY ATMOSPHERIC PRES-

SURE CHANGES,
Torse Univ. at Austin. Dept. of Geological Sciences L. J. Turk

Journal of Hydrology, Vol 26, No 1/2, p 1-16, July 1975. 8 fig, 37 ref.

Descriptors: *Water table. *Water level fluctuations, *Atmospheric pressure, *Diurnal, *Great Salt Lake, *Utah, Seasonal, Water table aquifers, Capillary fringe, Zone of aeration, Particle size, Model studies, On-site investigations, Pores, Air, Monitoring, Observation wells. Identifiers: *Bonneville Salt Flats, Entrapped air.

The shallow water table at the Bonneville Salt Flats, Utah, fluctuates 1.5 to 6.0 cm per day during the summer and 0.5 to 1.0 cm per day during the winter. Highest water levels occur in late afternoon and lowest levels occur in mid-morning. Similar fluctuations occur in many other localities having shallow, fine-grained aquifers. The fluctuations are attributed to temperature-related atmospheric pressure changes acting on the capillary zone. This proposed mechanism involves the transfer of water from below the water table to the capillary fringe in response to lower pressure, and transfer of water from the capillary fringe to the water table in response to higher pressure. Rapid volume changes of air entrapped in the capillary pores account for the expulsion of infusion of capillary water. Laboratory experiments with an artificial aquifer confirmed that such fluctuations can occur rapidly when the only variable is pressure. In this case no intervening confining layer existed, so the mechanism was distinctly different from the mechanism which causes blowing wells. The correct interpretation of fluctuations of several centimeters can be of considerable im-portance in monitoring small changes of water levels in manometers emplaced to monitor seepage through dams or levees, or in measuring small drawdowns in observation wells during pumping tests of fine-grained aquifers. (Visocky-ISWS)

SOIL WATER MEASUREMENT WITH AN IN-EXPENSIVE SPECTROPHOTOMETER, Agricultural Research Service, Durant, Okla.

Water Quality Management.

S. A. Bowers, S. J. Smith, H. D. Fisher, and G. E. Miller.

Soil Science Society of America Proceedings, Vol 39, No 3, p 391-393, May-June 1975. 4 fig, 1 tab, 3

Descriptors: *Soil water, *Water measurement, *Instrumentation, *Soil moisture meters, *Spectrometers, On-site tests, Analytical *Spectrometers, On-site tests, Analytical techniques, Electronic equipment, Moisture, Moisture content, Evaluation, Available water, Soil moisture, Soil properties, Moisture availability, Spectrophotometry, Clay loan, Silts, Clays, Sands, Absorption.

Identifiers: *Soil water content, Soil water extraction, Surface soils, Sandy loam, Silt loam, Soilmethanol extract.

small, portable, battery-powered, trophotometer was developed to measure soil water content rapidly. Soil water contents of 16 soils were related to the absorbance at 1.94 micrometers by a soil-methanol extract by the curvilinear equation: Absorbance = K(% soil water/100 + 1.025(% soil water)) + a. With the exception of Houston Black Clay, one equation could be used for all soils. Determination time for individual samples was approximately 15 (Henley-ISWS) W75-12081

Lakes-Group 2H

DIURNAL AND SEASONAL SOIL WATER UP-TAKE AND FLUX WITHIN A BERMUDAGRASS ROOT ZONE.

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. For primary bibliographic entry see Field 2D. W75-12082

ON SOLVING THE FLOW EQUATION IN UN-SATURATED SOILS BY OPTIMIZATION: HORIZONTAL INFILTRATION,

Connecticut Agricultural Experiment Station, New Haven. Dept. of Ecology and Climatology. J-Y. Parlange.

Soil Science Society of America Proceedings, Vol 39, No 3, p 415-418, May-June 1975. 1 tab, 11 ref, 1 append.

Descriptors: *Unsaturated flow, *Absorption, *Diffusivity, Soils, Soil water, Soil physics, Soil mechanics, Infiltration, Mathematics, Mathematical studies, Optimization, Subsurface waters, Soil moisture, Flow, Diffusion, Soil water movement, Agriculture, Agronomy, Clays, Labor. Identifiers: Yolo light clay.

Recently, integral methods have been developed that provide accurate approximations to the diffu-sion equation with rapidly varying diffusivity, but require in general some numerical iteration. A new analytical approach was developed which yields optimal approximation without any numerical iteration. The method was applied to the problem of one-dimensional horizontal infiltration of water in soils. It was shown that the sorptivity is an invariant, which can be expressed in terms of the sum of two integrals involving the diffusivity. The analytical results were in excellent agreement with analytical results were in excellent agreement with numerical calculations for Yolo light clay. Since diffusivity for most soils varies even more rapidly than for Yolo light clay, the approach should prove even more accurate for most soils. The technique is quite general and can be adapted to solve other problems of water movement in un-saturated soils. (Sims-ISWS) W75-12083

A ONE-STEP WETTING PROCEDURE FOR DETERMINING BOTH WATER CHARACTERISTIC AND HYDRAULIC CONDUCTIVITY OF A SOIL CORE,

Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science. L. R. Ahuja.

Soil Science Society of America Proceedings, Vol 39, No 3, p 418-423, May-June 1975. 9 fig, 8 ref.

Descriptors: *Hydraulic conductivity, *Soil water movement, *Unsaturated flow, Soil mechanics, Soil physics, Soil physical properties, Numerical analysis, Laboratory tests, Diffusivity, Soils, Soil water, Soil properties, Soil moisture, Agriculture, Agronomy, Wetting. Identifiers: *Soil water characteristic, Suction.

Reasonable simplifications were used to obtain both the suction-water content and unsaturated hydraulic conductivity relationships from data measured during wetting of a relatively dry soil core through a high-hydraulic-resistance porous plate. For soil-water contents below the bubblingpressure value, the two functions were assumed to be of previously known power forms. The resulting similarity was then utilized to obtain these functions from cumulative inflow and wetting-front position data, using an iterative numerical solution of the ordinary differential equations. Accuracy of the solution was tested on a set of generated data. Tests of the technique as a whole on generated data for one soil and experimental data for another showed it to be promising. For water contents above the bubbling-pressure value, a method was suggested to obtain the two hydrau-lic properties from cumulative inflow and soilwater s er suction at the other end of the core. (Sims-W75-12084

CATION DISTRIBUTION IN SOILS AS RE-LATED TO SEWAGE SLUDGE DISPOSAL ON LAND, Guelph Univ. (Ontario). Dept. of Land Resource

For primary bibliographic entry see Field 5B. W75-12139

CHEMICAL TESTS FOR PLANT AVAILABLE METALS IN SOILS.
Guelph Univ. (Ontario). Dept. of Land Resource

Science. For primary bibliographic entry see Field 5A. W75-12142

A SIMULTANEOUS CALCULATION OF THE CAPILLARY-SORPTION POTENTIALS, MOISTURE AND FLOW OF WATER IN SOILS USING A COMPUTER AND EQUATIONS OF SOIL MOISTURE MOVEMENT, (IN RUSSIAN), V. Ya Kulik, and N. V. Piomugina Dokl Vses Ord Lenina Akad S-Kh Nauk Im V I Lenina., No 3, p 41-43. 1973.

Descriptors: *Soil moisture, Soil water movement, *Sorption, *Capillary action, Flow, Equations.

An algorithm which allows simultaneous reception of four values necessary for a determination of a number of applied problems, is described. A calculation of the flow of moisture allows incidental determination of the moisture-exchange problem between layers of soils without substantial increase in the loss of the time of the computer. Copyright (c) 1974, Biological Abstracts, Inc. W75-12208

ACTIVITY OF ENZYMES (PROTEASE AND UREASE) AND FORMS OF MOBILE NITROGEN IN THIN PEAT SOIL OF THE SECOND YEAR OF USE, (IN RUSSIAN), Akademiya Navuk BSSR, Minsk. Inst. of Experimental Botany

For primary bibliographic entry see Field 5B. W75-12216

RAPID SOIL MOISTURE DETERMINATION BY IMMERSION METHOD, (IN KOREAN), Institute of Plant Environment, Suwon (Republic

of Korea). K. N. Im, I. S. Cho, and Y. H. Shin. Res Rep Off Rural Dev (Plant Environ) (Suwon),

No 15, p 37-41, 1973. Descriptors: *Soil moisture, Measurement, Methodology, Analytical techniques. Identifiers: *Immersion method, Oven-dry

A rapid method of soil moisture determination based on the Archimedes principle was compared with the oven-dry method. The methods showed a high correlation and low standard deviation. The rapid method gives an accurate determination in 4-5 min. and may be used in the field.—Copyright 1974, Biological Abstracts, Inc. W75-12240

STATISTICAL INVESTIGATION OF THE RELATION BETWEEN ABSORBABILITY AND CONTENT OF GRAINSIZE FRACTIONS AND HUMUS, (IN RUSSIAN),

L. N. Kuleshov. Izv Akad Nauk Az SSR Ser Biol Nauk. No 1, p 26-

Descriptors: Humus, *Absorption, Clays, *Grain, *Statistical studies, *Soils.
Identifiers: *USSR, Chernozems, Azerbaidzhan.

The advantage of statistical analysis for revealing the relation between interrelated properties of soils is demonstrated. Particles larger than 0.005

mm have absorbability. In chernozems of the USSR absorbability is due mainly to humus, the effect of the clay fraction being secondary, whereas in the compact soils of Azerbaidzhan absorbability is governed by the content of clay while the effect of humus is negligible.—Copyright 1974, Biological Abstracts, Inc. W75-12344

2H. Lakes

LIFE HISTORY, ECOLOGY, AND MANAGE-MENT OF THE CARP, CYPRINUS CARPIO LINNAEUS, IN ELEPHANT BUTTE LAKE. New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 6B.
W75-11972

N AND P DISTRIBUTION IN LAKE KINNERET (ISRAEL) WITH EMPHASIS ON DISSOLVED ORGANIC NITROGEN,

Israel Oceanographic and Limnological Research Ltd., Haifa. For primary bibliographic entry see Field 5C. W75-11975

RESPONSE OF LAKE SUPERIOR ALGAE TO NUTRIENTS AND TACONITE TAILINGS, Texas Univ. at Dallas, Richardson. Inst. for Eavironmental Sciences. For primary bibliographic entry see Field 5C. W75-11976

PRIMARY PRODUCTION IN THE PLANKTON COMMUNITY OF A TROPICAL LAKE, Savannah River Ecology Lab., Aiken, S.C. For primary bibliographic entry see Field 5C. W75-11978

CLASSIFICATION OF WISCONSIN LAKES BY TROPHIC CONDITION. Wisconsin Dept. of Natural Resources, Madison.

Bureau of Water Quality. For primary bibliographic entry see Field 5C. W75-11979

LIMNOLOGY OF LAKES OF THE SYLVANIA RECREATION AREA, OTTAWA NATIONAL

Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.

J. P. Crumbrine, and A. M. Beeton. Special Report No 24, March 1975, 88 p., 33 fig. 20 tab. 29 ref.

Descriptors: *Limnology, *Michigan, *Baseline studies, Geology, Soils, Vegetation, Climatic data, Hydrology, Physical properties, Regional analysis, Chemical properties, Dimensions, Water temsis, Chemical properties, Dimensions, Water tem-perature, Hydrogen ion concentration, Conduc-tivity, Heavy metals, Nutrients, Gases, Coliforms, Benthos, Phytoplankton, Zooplankton, Primary productivity, Precipitation(Atmospheric), Radia-tion, Winds, Ions, Diatoms, Color, Light penetra-tion, Recreation.

Identifiers: *Sylvania Recreation Area(Mich), *Ottawa National Forest(Mich).

As a base for sound management of the Sylvania Area 14 lakes were studied. Differences resulted from varying groundwater inflow. Drainage lakes had the lowest sulfate, highest calcium, magnesi-um, sodium, silica, potassium, chloride, iron, phosphorus, and nitrate; larger watersheds and groundwater inflow; and were mesotrophic-oligotrophic and eutrophic. Seepage lakes had the highest sulfate, lowest concentrations of all other chemicals, and were mesotrophic-oligotrophic. There was an inverse relationship between color and transparency. Iron concentrations were re-

Field 2-WATER CYCLE

Group 2H-Lakes

lated to transparency. Seston concentrations caused seasonal transparency fluctuations. In productive lakes, summer dissolved oxygen con-centrations decreased uniformly from surface to bottom. Nutrient-poor lakes had oxygen maxima in the epilimnion which decreased with depth in summer. Anaerobic conditions in the hypolimnia caused low benthic populations as indicated by the predominance of Chaoborus populations. Fragilaria pinnata and F. crontonensis were associated with drainage lakes. Melosira, Cyclotella, and non-diatoms were abundant in seepage lakes. Seven species of copenods and cladocerans were present, but Leptodiaptomus minutus was absent in drainage lakes, some copepods were absent and phytoplankton low in bog lakes. Studies on responses of the Experimental Lakes Area of Canada to fertilization should be considered in management decisions concerning Sylvania lakes. (Buchanan-Davidson-Wisconsin) W75-11981

DISTRIBUTION AND BIOMASS MACROPHYTES IN LAKE DGAL MALY, Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). For primary bibliographic entry see Field 8I. W75-11993

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. XIV. THE RELATIONS BETWEEN THE FISH AND THE RELATIONS INCOMPONENTS
OTHER BIOCENOTIC COMPONENTS
(SUMMING UP THE STUDIES),
(SUMMING UP THE

For primary bibliographic entry see Field 8I. W75-11998

THE LAKE AS ECOSYSTEM, G. H. Schwabe. Universitas, Vol 16, No 3, p 213-226, 1974.

Descriptors: *Lakes, *Ecosystems, Limnology, Biological properties, Life cycles, Balance of na-

Inland water bodies are equated with ecosystem models. Water availability is the indispensable basic material for all biotic precesses. Geological age, relatively homogeneous salt concentration, low, fluctuating dissolved substance contents distinguish oceans from inland waters. Inland water bodies are sections of the earth's surface exposed to the sun's radiation and are components of the ecosphere, an indistinctly contoured boundary at the base of the atmosphere. Since light cannot penetrate the earth, organic substance formation is possible only on the surface. Light can penetrate water, and with dissolved inorganic ingredients and water's high density and viscosity, plants can develop along special pathways. Plankton are found in every stationary water body, are the most impressive community of organisms, and reflect a lake's ecological character. Photosynthesis of organic substance is the fundamental process of life, but cannot ensure permanent continuation of the total life process. Lakes have characteristic biocoenoses, are internally balanced systems of plant and animal populations, are subject to fluc-tuations of physical conditions, but may themselves modify these conditions; they can maintain a balance under wide-ranging external conditions, are limited to a self-contained water mass, and cannot be extracted from the ecosphere. (Buchanan-Davidson--Wisconsin) W75-11999

DANGER SIGNS FOR TAHOE'S FUTURE, California Univ., Davis. Div. of Environmental Studies.

For primary bibliographic entry see Field 5C. W75-12002

PREDICTIVE MODELS FOR GREAT LAKES HYDROLOGY

State Univ. of New York, Buffalo. Dept. of Civil Engineering.

For primary bibliographic entry see Field 2A. W75-12049

DAILY FALL ACTIVITY AND DIRECTION OF MOVEMENTS OF FISH IN LAKE QUENOUILLE IN THE LAURENTIANS, (IN

National Inst. of Scientific Research, Quebec. Rev Can Biol, Vol 32, No 4, p 233-239, 1973.

Descriptors: *Canada, *Fish populations, *Fish management, Fish migration, Lakes, *Bullheads, *Yellow perch. Identifiers: *Circadian rythms(Fish), Laurentians,

Lepomis-Gibbosus, Perca-flavescens, Quebec, *Lake Quenouille(Quebec), *Pumpkinseed(Fish).

A knowledge of the circadian rhythms of fish and their displacement patterns is important for the pursuit of fish population studies and for the rational management of fishery resources. A study of lake Quenouille (a small warm shallow water lake in Quebec, Canada), involving gill net fishing during 4 consecutive weekends, had led to the following observations: the yellow perch (Perca flavescens) and the pumpkinseed (Lepomis gibbosus) are diurnal fishes exhibiting maximal activity from 8-9 h and 9-11 h respectively; the brown ty from 8-9 n and 3-11 n respectively, the bullhead (Ictalurus nebulosus) is noctural, exhibiting maximal activity between 22 h and 2 h. A study of fish deplacement patterns revealed that the of the deplacement patterns revealed that me average angle of displacement with respect to the shoreline was 68-69 degrees for the yellow perch and pumpkinseed and 90 degrees for the brown bullhead.--Copyright 1974, Biological Abstracts, Inc. W75-12064

VARIATIONS OF THE TURBULENT FLUXES OF MOMENTUM, HEAT AND MOISTURE OVER LAKE ONTARIO,

Environment Service, Toronto Atmospheric (Ontario)

G. A. McBean, and R. D. Paterson. Journal of Physical Oceanography, Vol 5, No 3, p 523-531, July 1975. 7 fig, 2 tab, 10 ref.

*Turbulence, *Lake Ontario, Descriptors: *Lake Ontario, *Turbulence, *Variability, Moisture, Momentum transfer, Latent heat, Water vapor, Atmosphere, Instru-mentation, Aircraft, Time series analysis, Ther-mometers, Winds, Temperature, Evaporation, Upwelling, Wind velocity, Radiosondes. Identifiers: *Internation Field Year for the Great Lakes, Doppler radar, Momentum flux, Sensible best Time histories, Sensors, Radiation ther-Descriptors:

heat, Time histories, Sensors, Radiation ther-

During the International Field Year for the Great Lakes, measurements of turbulence and turbulent fluxes were made with an instrumented jet aircraft. After removing effects of aircraft motion, the fluxes were computed by the eddy correlation method. Flights were made along the north shore, along the center of the lake, and across the shoreline on four days in October 1972 at a flight level of 150 m. Elicibits were medicat break at level of 30, 60. level of 150 m. Flights were made at levels 30, 60, 150, and 300 m over another location on the lake. The horizontal variations in the fluxes at 150 m above the surface were illustrated and their relationship to the surface pattern discussed. It was found that the 150 m pattern was displaced downstream about 15 km. The heat flux pattern showed considerable horizontal variation. These variations, coupled with a downwind displacement at higher levels, added to the difficulties in esti-mating the fluxes from a few measurements. The fluxes did show an approximately linear decrease with height. Further work is indicated before the fluxes of momentum, heat, and moisture from a large lake can be completely understood. (Roberts-ISWS) W75-12078

THE SPATIAL AND TEMPORAL VARIATIONS OF THE TURBULENT FLUXES OF HEAT, MO-MENTUM AND WATER VAPOR OVER LAKE

National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Environmental Research Labs.

For primary bibliographic entry see Field 2D. W75-12079

PRAIRIE POTHOLE ECOLOGY AND THE FEASIBILITY OF GROWING RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) IN PRAIRIE POTHOLES, North Dakota State Univ., Fargo. Dept. of Zoolo-

For primary bibliographic entry see Field 81. W75-12157

COASTWISE CURRENTS IN THE VICINITY OF CHICAGO, AND CURRENTS ELSEWHERE IN SOUTHERN LAKE MICHIGAN,

Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science. E. C. Monahan, and P. C. Pilgrim.

(1975), 152 p. NOAA Grant No.04-5-158-16.

Descriptors: *Currents(Water), *Coasts, *Ocean currents, *Rip currents, Current meters, Drifting(Aquatic), Flow, Water circulation, *Lake Michigan, Great Lakes, Wind velocity, Drift bot-tles, Hydrologic data, Aquatic drift.

Identifiers: *Coastal currents, *Lake currents, *Coastwise currents, Current patterns, Current measurement, Current direction, Chicago waters, *Lake circulation, Vertical current, Drogues, Wind direction, Surface drifters, Water tempera-ture, Lake data, Current data.

The study was undertaken to obtain background information about the coastwise currents in the immediate vicinity of the city of Chicago, Illinois, and to a lesser degree to characterize the circulation in the southern basin of Lake Michigan. The motivation for conducting this research arises from the city of Chicago's active consideration of the construction of recreational islands offshore of that city. Some of the conclusions drawn from the study are 1) the currents encountered in this region are typically weak (less than 0.6 knots); 2) a degree of correlation between current and wind directions is often evidenced; 3) some observations show a marked change in current at the depth of thermocline; 4) offshore currents near Chicago (at subsurface mooring locations) during summer run primarily to NW or N, in accord with earlier FWPCA (1967) findings; 5) a clockwise circulation in the southern basin of Lake Michigan exists during the summer months; 6) this general circulation pattern in the southern basin of Lake Michigan is not compatible with the FWPCA (1967) results; 7) the findings of Harrington's (1895) classical study are also not in accord with the present findings. (NOAA) W75-12161

DIVERSION AND WITHDRAWAL OF ADDI-TIONAL WATER FROM LAKE MICHIGAN INTO THE ILLINOIS WATERWAY. For primary bibliographic entry see Field 4A. W75-12197

TOXIC WATERS (DISCUSSION OF RECENT FEDERAL ACTION AGAINST WATER POLLU-

Resources for the Future, Inc., Washington, D.C. For primary bibliographic entry see Field 5G. W75-12230

2I. Water In Plants

RELATIVE THROUGHFALL ENRICHMENT BY BIOLOGIC AND BY AEROSOL-DERIVED MATERIALS IN LOBLOLLY PINES,

Mississippi Univ., University. Dept. of Geology and Geological Engineering. For primary bibliographic entry see Field 5B. W75-11853

SURVEY OF THE MATRIC WATER OF VARI-

OUS PLANT GROUPS, Basrah Univ., Al Basrah (Iraq). H. Al-Saadi, and H. H. Wiebe. Plant Soil, Vol 39, No 2, p 253-261, 1973.

Descriptors: Plant management, Plant physiology, Xerophytes, Halophytes, Salt tolerance, Drought tolerance, Aquatic plants. Identifiers: *Chenopodiaceae, *Matric water.

Matric water (matric-bound water) was measured as the water retained by plant material after equilibration on a pressure membrane or ultra filter. At increasing pressures, lower amounts of water are held by matric or colloidal surface forces. Matric water was expressed as a percent of either the dry weight or the original water content. Plant material was oven dried, ground, and then saturated with water prior to the matric determination, which occurred in the pressure membrane filter as either 1 bar or 20 bars, supplied by cylinder N for 72 h. Matric water was measured in leaves or in photosynthetic stem tissues from 60 species, including hydrophytes, xerophytes and halophytes. The correlations between matric potentials and drought and salt tolerance ratings were determined. High matricbound water values as well as high tissue water contents were found in species of Chenopodiaceae, which are considered more salt and drought tolerant than species of other plant groups. Low matric water values were found in the coniferous tree leaves and in grasses, and intermediate values were found in Com-positae, miscellaneous herbaceous species, and deciduous trees. No correlation could be found between either salt or drought tolerance ratings and the matric percent when the latter was ex-pressed on a dry weight basis. When matric water was expressed as a percent of the original water content, there was a positive correlation with drought tolerance ratings in all families studied except succulent Chenopodiaceae.--Copyright 1974, Biological Abstracts, Inc. W75-11883

THE WATER RELATIONS OF HEMLOCK (TSUGA CANADENSIS): I. SOME EQUILIBRI-UM WATER RELATIONS AS MEASURED BY THE PRESSURE-BOMB TECHNIQUE,

Toronto Univ. (Ontario). Dept. of Botany. M. T. Tyree, J. Dainty, and M. Benis. Can J Bot, Vol 51, No 8, p 1471-1480, 1973. Illus.

Descriptors: *Hemlock trees, *Water balance, Measurement, Turgidity analysis.
Identifiers: Tsuga-canadensis, techniques, *Pressure-bomb measurement.

Theoretical and experimental aspects of the equilibrium water relations of excised hemlock (T. canadensis) shoots are examined. The equilibrium water relations of hemlock were determined by using the pressure-gomb technique on shoots 15-40 g in fresh weight. At or near full turgor the osmotic pressure of the cells averages 16.5 plus or minus 0.4 bars. The fraction of the total water content of hemlock shoots residing in the living cells is 0.77 olus or minus 0.04. When hemlock shoots are near plus or minus 0.04. When hemlock shoots are near full turgor the balancing pressure will change linearly with the volume expressed provided the volume changes represent less the 1/2% of the total shoot water. (See W75-11901 and W75-11902)—Copyright 1974, Biological Abstracts, Inc. W75-11900 THE WATER RELATIONS OF HEMLOCK (TSUGA CANADENSIS): II. THE KINETICS OF WATER EXCHANGE BETWEEN THE SYMPLAST AND APOLAST,

Toronto Univ. (Ontario). Dept. of Botany. M. T. Tyree, and J. Dainty. Can J Bot, Vol 51, No 8, p 1481-1489, 1973. Illus.

Descriptors: *Hemlock trees, *Water balance, Physical properties, *Mode of action, Plant

growth, Analysis. Identifiers: Apoplast, Symplast, Tsuga-canadensis, *Pressure-bomb measuring technique, Water exchange.

A theoretical analysis of the events that occur while a plant enclosed in a pressure bomb evolves from I equilibrium balancing pressure to another is presented. The initial rate of efflux from any I cell in response to a pressure increment of delta P equals (ALp)1 delta P, where (ALp)i is the surface area times hydraulic conductivity of the cell's semipermeable membrane(s). If the volume changes and pressure increment are small, the cell will approach equilibrium exponentially. The 1/2 time of the exponential process is governed by (ALp)iki, where ki is the cell constant (= the combined rate of change of osmotic and turgor pressure with the volume expressed from the cell). Experimental studies of the kinetics of water exhange between the symplast and apoplast of hemlock (T. canadensis) shoots in a pressure bomb reveal that the cells collectively behave as though they fall into 3 distinct populations which approach equilibrium with different 1/2 times. (See also W75-11900)--Copyright 1974, Biological Ab-W75-11901

THE WATER RELATIONS OF HEMLOCK (TSUGA CANADENSIS): III. THE TEMPERA-TURE DEPENDENCE OF WATER EXCHANGE IN A PRESSURE BOMB,
Toronto Univ. (Ontario). Dept. of Botany.

M. T. Tyree, M. Benis, and J. Dainty

Descriptors: *Hemlock trees, *Water balance, Descriptors: "Hemitors trees, water constructions," Temperature, Physical properties, Equations, "Mathematical studies, "Water utilization. Identifiers: Apoplast, Symplast, Tsuga-canadensis, Arrhenius rate theory, "Pressure-bomb

sis, Arrh technique.

The pressure-bomb technique was used to mea-The pressure-bomb technique was used to measure the temperature dependence of water exchange between the apoplast and symplast of hemlock (T. canadensis) shoots. By applying the Arrhenius rate theory, the activation energy for water exchange in the whole shoot equals 25.9 plus or minus 0.6 x 10 to the 3rd power J/mole. A theory is proposed on the basis of the Arrhenius rate equations which allows prediction of the relative magnitudes of the membrane resistance, Rm, and the extracellular resistance, Rx, to water permeation. On this basis Rm may be at least one-quarter of Rx and may even exceed Rx. (See also W75-11900)--Copyright 1974, Biological Abstracts, Inc. W75-11902

FUNGUS DISEASES OF WHEAT ON IR-RIGATED LANDS, (IN RUSSIAN), Volgograd Agricultural Inst. (USSR). A. V. Malikova

Mikol Fitopathol, Vol 8, No 1, p 63-64, 1974.

Descriptors: *Wheat, Plant diseases, USSR, *Soil fungi, *Irrigation effects, *Rusts, *Powdery mil-

Wheat is affected by the same diseases on irrigated and unirrigated lands, but under irrigation conditions fungus development is slightly dif-ferent. Under irrigation conditions the development of leaf rust and powdery mildew is inten-sified, whereas the development of root rot of spring wheat decreases considerably. Wheat plants cultivated under ontimum moisture conditions were less infected with loose smut. With an increase of the irrigation rate and N application, the infection of plants with leaf rust and powdery mildew increased.--Copyright 1974, Biological Ab-

PHENOLIC COMPOUNDS OF WHEAT LEAVES UNDER DROUGHT STRESS,

Oklahoma State Univ., Stillwater. Dept. of Botany

and Plant Pathology. S.-D. Tsai, and G. W. Tood.

Phyton Rev Int Bot Exp. Vol 30, No 1/2, p 67-75,

Descriptors: *Leaves, *Chemical analysis, Chromatography, *Phenols, *Moisture stress, Drought tolerance, Plant physiology, *Wheat, *Crop response. Identifiers: Wheat.

Leaf samples were extracted and analyzed for their content of phenolic compounds by 2-dimensional paper chromatography. They were subdivided into 3 fractions: (I) Free phenolics soluble in 40% and 95% ethanol; (II) Soluble in 40% ethanol but insoluble in 95% ethanol hydrolyzable with NaOH; and (III) Insoluble in 40% hydrolyzable with NaOH ethanol. UV-Absorbance of 40% ethanol-soluble materials at wave length of 275 nm was increased as a result of severe drought in the drought-susceptible cultivar 'Ponea' but did not change in drought-resistant 'KanKing.' Analysis by the Folin-Denis test showed a 25-27% decline in phenolic compounds as a result of water stress in both cultivars, mostly due to a decline in fraction (II). Twenty compounds were tentatively identified of a total of about 37 spots that were located. Of these, 3 disappeared following drought in both cultivars and 5 others showed substantial declines. Two unknown compounds appeared as a result of drought in both cultivars. If phenolic compounds are involved in cellular injury following drought stress this might be due to release of these substances into the cytoplasm rather than to increased synthesis.--Copyright 1973, Biological Abstracts, Inc.

THE EFFECT OF HYDROGEN IN CONCEN-TRATIONS IN SIMULATED RAIN ON THE MOSS TORTULA RURALIS (HEDW.)SM,

Montana Univ., Missoula. Dept. of Botany. For primary bibliographic entry see Field 5C. W75-11987

DISTRIBUTION OF AQUATIC MACROPHYTES RELATED TO PAPER MILL EFFLUENTS IN A SOUTHERN MICHIGAN STREAM,

Southeast Missouri State Univ. Cape Girardeau Dept. of Biology.
For primary bibliographic entry see Field 2B.
W75-11991

DISTRIBUTION OF SOLAR RADIATION WITHIN A DECIDUOUS FOREST.

National Oceanic and Atmospheric Administra-tion, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab.

B. A. Hutchison, and D. R. Matt. In: 1973 Annual Report; Report ATDL-106, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 1-30, December 1974, 15 fig, 1 tab, 7 ref.

Descriptors: *Solar radiation, *Deciduous forests, *Frequency curves, Forests, Radiation, Light in-tensity, Canopy, Light penetration, Vegetation, Cloud cover, Distribution patterns, On-site investigations, Microenvironment, Atmosphere,

Photometry. Identifiers: Radiation flux densities, Tulip poplar.

Field 2-WATER CYCLE

Group 21-Water In Plants

It has long been recognized that the time distribution of radiative flux densities within vegetative stands depart from Gaussian. As early as 1911, it had been noted that time averages of radiation in a spruce forest were meaningless owing to the nonnormality of the distribution of radiation values. In general, time distributions reported in the litera-ture are unimodal and skewed to higher flux densities. Most of these studied deal only with radiation reaching the forest floor. As part of the U.S. International Biological Program Eastern Deciduous Forest Biome effort at Oak Ridge, the distribution of solar radiation is being studied in a tulip poplar (Liriodendron tulipifera) forest in vertical and horizontal space and the temporal changes in this distributions. Results indicated that time distributions of flux densities in this forest are non-normal. Further, the amount of skewness increases with elevation in this forest. Time distributions of flux densities were compared for days having complete overcast, for clear days, and for days of varying cloud cover and type. It was found, within the forest, the distributions of flux densities are similar on all days and that increasing cloudiness only narrows the distribution curve and decreases the amount of skewness. (See also W75-12033) (Sims-ISWS) W75-12034

DIURNAL AND SEASONAL SOIL WATER UPTAKE AND FLUX WITHIN A BERMUDAGRASS ROOT ZONE.

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. For primary bibliographic entry see Field 2D. W75-12082

THE ICHTHYOFAUNA OF THE ROKYTNA RIVER: I. SPECIES COMPOSITION, ABUNDANCE AND BIOMASS,

Ceskoslovenska Akademie Ved, Brno. Ustav pro Vyzkum Obratlovcu.

Zool Listy, Vol 22, No 2, p 165-180, 1973.

Descriptors: *Biomass, Fish reproduction, *Trout. Identifiers: Alburnoides-Bipunctatus, Barbus-Barbus, Chondrostoma-Nasus, Cobitis-Tacnia, *Czechoslovakia(Rokytna River), Gobio-Gobio, Leuciscus-Cephalus, *Barbel zone(Streams).

A total of 28 spp. of fishes and 2 interspecific hybrids were ascertained in the Rokytna River (Czechoslovakia). Of that number, 10 spp. occur in the stream due to stocking by anglers, or invasion from ponds. In all, 18 spp. are indigenous in the stream, reproducing naturally. In the past, the species composition of the fish fauna of the stream has changed little, except for Cobitis taenia whose habitat was destroyed by amelioration measures. Most of the stream can be characterized as the barbel zone; the upper part of the stream is unset-tled and the spring region is a trout zone. In the lower and middle reaches of the stream abundance fluctuated around 10,000 fish/ha, and twice that number in the upper reaches of the Rokytna River and its tributary, the Rouchovanka Stream. Chon-drostoma nasus. Leuciscus cephalus and Barbus barbus, are of fishery importance. Gobio gobio and (Alburnoides) bipunctatus were also numerically important. In sections outside the trout zone, the biomass varied between 500 and 600 kg/ha; within the trout zone it did not exceed 300 kg/ha.--Copyright (c) 1974, Biological Abstracts, Inc. W75-12129

INFRA-RED PSYCHROMETER DETECING CHANGES IN THE HUMIDITY OF LEAF BOUNDARY LAYERS, Adelaide Univ. (Australia). Dept. of Botany D. W. Sheriff.

J Exp Bot, Vol 24, No 81, p 641-647, 1973.

Absorption, Infrared radiation, Descriptors: *Water vapor, Measurement, *I. *Boundary layers, *Humidity, Hygrometry. *Leaves.

Identifiers: *Nicotiana-glauca, *Psychrometers(Infrared)

An apparatus is described which uses the principle of the absorption of IR light by water vapor for the measurement of water-vapor concentrations in the atmosphere or in the boundary layers of leaves (of Nicotiana glauca).--Copyright 1974, Biological Abstracts. Inc. W75-12131

LIFE HISTORY NOTES AND MERISTIC VARIATION IN THE FRESHWATER FOUR-STICKLEBACK, SPINE APELTES QUADRACUS (MITCHILL), NEAR SEPT-ILES: OUEREC

Ottawa Univ. (Ontario). Dept. of Biology. G. Power, and B. W. Coad. Nat Can (Que)., Vol 100, No 3, p 247-251, 1973.

Descriptors: *Sticklebackes, *Life history studies, *Canada, Fish food organisms, Diptera, Ecology, Crustaceans, Mayflies, Freshwater fish, Fish population.

Identifiers: Apeltes-Quadracus, *Meristic variation, Quebec, Sept-Iles.

An isolated freshwater population of the fourspine stickleback was examined for aspects of its ecology and meristic variation. Three age groups were found but only females survived into a 3rd yr of life. Egg numbers and diameters were determined during the breeding season, June-July. Older fish had more and larger eggs. The diet consisted of Chironomidae larvae, Cladocera and Ephemerop-tera larvae. Vertebral and gill raker number were lower in the freshwater population compared to a marine population but fin ray counts were similar. The significance of these similarities and differences is discussed. The freshwater population was probably isolated from a marine counterpart by formation of a waterfall several thousand years ago.--Copyright (c) 1974, Biological Abstracts, W75-12176

ROLE OF EPIDERMAL CELL TURGOR ON STOMATAL REGULATION IN ISOLATED EPIDERMAL PEELINGS OF CITRULLUS COLOCYNTHIS LINN. (SCHRAD.),

Jodhpur Univ. (India). Dept. of Botany M. C. Bhandari, and D. N. Sen.

Biochem Physiol Pflanz (BPP), Vol 164, No 2, P

Descriptors: *Stomata, Systematics, Epidermis, Osmatic pressure, Plant growth. Identifiers: *Citrullus-Colocynthis, *Epidermal, Cell turgor, Plasmolysis, Starch, Turgor

Epidermal cell turgor appeared to play a definite role in the regulation of stomatal pores in isolated epidermal peelings of C. colocynthis. Guard cells and their surrounding epidermal cells had different osmotic potentials and absorbing capacities. Plasmolysis in epidermal cells caused by incubating peclings in suitable sucrose solutions, led to the lowering of their turgor potentials, which resulted in opening of the stomata. Any increase in turgor potential of epidermal cells caused by incubation of such peelings in water resulted in closure of sto-mata. Water from plasmolysed epidermal cells was taken up by guard cells due to greater difference of osmotic potentials between epidermal cells and guard cells than between epidermal cells and the incubation medium. When peelings with plasmolysed epidermal and guard cells were incubated in water, water moved into the guard cells from the medium because of its non-availability in plasmolysed epidermal cells. As the pore opened, the starch in guard cells disappeared, but the cause of this could not be ascertained .- Copyright 1974, Biological Abstracts, Inc. W75-12323

PHOSPHORUS METABOLISM AND RESPRIRATION IN WHEAT LEAVES AND ROOTS IN THE CASE OF WATER DEFIENCY, (IN RUSSIAN), Vsesoyuznyi Institut Rastenievodstva, Leningrad

For primary bibliographic entry see Field 3F. W75-12362

2.J. Erosion and Sedimentation

A MOBILE SPRINKLER IRRIGATION FACILI-TY FOR MEASUREMENT OF SURFACE RU-AND SOIL EROSION (EINE TRANS-PORTABLE BEREGNUNGSANLAGE FUER DIE MESSUNG VON OBERFLAECHENABFLUSS UND BODENABTRAG),
For primary bibliographic entry see Field 7B. W75-11948

WATER RESOURCES DATA FOR CALIFORNIA, 1973; PART 2. WATER QUALITY RECORDS.

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 7C. W75-11962

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 8. WESTERN GULF OF MEXICO BASINS. Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-11965

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 8. WESTERN GULF OF MEXICO BASIN. Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-11966

AN APPLICATION OF SIMULATED RAINFALL MODELS TO FORECASTING OF THE LONG TERM VARIATION OF RIVER BED,

Osaka Univ. (Japan). Dept. of Civil Engineering. A. Murota, and M. Hashino.

In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 325-350, 1971. 12 fig, 4 tab.

Descriptors: *Sediment transport, *Rainfall, *Simulation analysis, *River beds, Model studies, Sediment load, Stochastic processes, Sediment yield, Sediment discharge, Dunes, Watersheds(Basin), Landslides, Dunes, Sediments, Debris Streamflow, avalanches, V Geomorphology. storage, Water Identifiers: *Japan, *Debris yields

The long-term variations of river bed being accompanied with the transversal supply of sediment transported from the watershed to the river channel was studied by numerical experiments. Enor-mous amounts of debris production due to landslides in the mountainous area have been caused by heavy rainfalls. Part of the debris may tumble down directly into the river channel and humps of debris in large scale are occasionally formed on the river bed. These dunes move down slowly in the channel, and our morphological question is whether the long-term variation of the bed profile will show any trend of convergence to the stable bed under natural environments. From stochastical evaluations of debris yields, it was discovered that the major factor affecting landslide generation and resulting debris is not directly precipitation but water storage in the drainage basin in the form of subsurface storage. The functional relationship between the watershed storage and debris yields was empirically established. If the rainfall

Chemical Processes—Group 2K

sequence has been properly simulated and the watershed storage has been calculated by run-off analyses, the probable occurrences of landslide and resulting quantities of debris may be forecast by the watershed storage versus debris yields function. Synthesis of rainfall simulations was reported. After calculations of supplemental inflow of sediment from the watershed to channels and preparation of simulated river flow, the river bed variations at the 26 km reach of our objective river were forecast extending over 10 years future. The analyses showed some negative interpretations for possibility of stable bed profile under actual environments. (See also W75-12014) (Lee - ISWS) W75-12028

SIMULATION OF THE SHORT-TIME SCOUR-FILL PROCESS IN ERODIBLE STREAMS WITH STOCHASTIC SEDIMENT TRANSFER AT THE STREAM BED.

Utah Water Research Lab., Logan.
J. P. Riley, K. Sakhan, and K. G. Renard. In: Systems Approach to Hydrology; Proceedings of the First Bilateral U.S.-Japan Seminar in Hydrology, Hawaii University, Honolulu, January 11-17, 1971. Water Resources Publications, Fort Collins, Colorado, p 351-378, 1971. 9 fig, 4 ref.

Descriptors: *Stream erosion, *Mathematical models, *Stochastic processes, *Boundary processes, Sediment transport, Suspended load, Bed load, Scour, Streambeds, Ephemeral streams, Flood waves, Sediments, Entrainment, Analytical techniques, Model studies, Markov processes, Alluvial channels.

In ephemeral streams, the occurrence of translatory waves causes the shortening of the time of rise of the hydrograph which in turn results in channel instability. A simulation model was developed to describe the dynamics of the channel in terms of: (1)two one-dimensional stream flow equations, (2)a one-dimensional sediment transport equation, an equation for the stream bed, and (3)a stochastic sediment transfer at the stream bed which also includes the bed load. The main advantage of the approach adopted is that the problem of separating bed load from suspended load was avoided by dealing with states of occurrence rather than physical zones. Stochastic processes were used to describe sediment transfer between states. It was found that the computational schemes used are stable. The term associated with the friction factor in the equation of momentum controls the stability in the solution. To demonstrate the operation of the model, real-time simulation was done using hypothetical data for a stream reach 24,000 feet in length. The suspended load tends to change instantaneously with the water hydrograph, while there is some lag in the response function associated with the bed load. Study results were presented in graphical form. (See also W75-12014) (Humphreys ISWS) W75-12029

SEDIMENT BASIN DESIGN,

Oakland County Drain Commissioner's Office, Pontiac, Mich.

G. Yrjanaineu. Water and Sewage Works, Vol 122, No 7, p 82-84, July 1975. 1 fig.

Descriptors: *Settling basins, *Sedimentation, *Rainfall-runoff relationships, *Urbanization, *Rainfall-runoff relationships, *Urbanization, *Earthworks, Construction, Maintenance, Flood frequency, Settling velocity, Rational formula, Runoff, Overflow, Erosion control, Design Identifiers: Emergency overflow.

Erosion and sedimentation have increased greatly due to increased urbanization, which exaggerates the problem by upsetting the balance nature has developed between rainfall and runoff. Settling theory can be utilized in an analysis of a sediment removal basin. Settling depends upon the rate of inflow, basin area, flow velocity through the basin, and the settling velocity of the particles. Because a construction project is usually completed within a year, it is reasonable to design a sediment basin to remove the peak silt load that would be generated by a one-year frequency storm. The one-year frequency flood can be calcu-lated using suitable values of one-year rainfall in-tensity, time of concentrations, and runoff factor. The facility needs to be kept in good working order to perform satisfactorily. (Singh-ISWS) W75-12042

MINI-PROJECT FOR AVON HARBOR,

NORTH CAROLINA, North Carolina State Univ., Raleigh. Center for Marine Coastal Studies For primary bibliographic entry see Field 8A. W75-12045

SMALL GROINS ON THE SHORES OF LONG ISLAND SOUND, New York Ocean Science Lab., Montauk. For primary bibliographic entry see Field 8A.

RUNOFF AND EROSION LOSSES. For primary bibliographic entry see Field 5B. W75-12137

W75-12046

INTRODUCTION OF SHORE EROSION CON-TROL LEGISLATION. For primary bibliographic entry see Field 6E. W75-12279

2K. Chemical Processes

GEOCHEMISTRY OF OIL-FIELD WATER AP-

PLIED TO EXPLORATION,
Bureau of Mines, Bartlesville, Okla. Bartlesville
Energy Research Center. For primary bibliographic entry see Field 4B. W75-11879

PHENOLIC COMPOUNDS OF WHEAT LEAVES UNDER DROUGHT STRESS, Oklahoma State Univ., Stillwater. Dept. of Botany

and Plant Pathology.
For primary bibliographic entry see Field 2I.
W75-11905

MERCURY CONCENTRATIONS IN OPEN OCEAN WATERS: SAMPLING PROCEDURE, Connecticut Univ., Groton. Marine Sciences Inst.; and Connecticut Univ., Groton. Marine Sciences Inst.; and Connecticut Univ., Groton. Dept. of Geology. For primary bibliographic entry see Field 5A. W75-11953

WATER RESOURCES DATA FOR CALIFORNIA, 1973: PART 2. WATER QUALITY RECORDS.

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 7C. W75-11962

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 6. MISSOURI RIVER BASIN.

Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-11964

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 8. WESTERN GULF OF MEXICO BASINS. Geological Survey, Reston, Va.

For primary bibliographic entry see Field 7C. W75-11965

A THERMODYNAMIC INTEGRAL EQUATION FOR THE EQUILIBRIUM MOISTURE PROFILE IN SWELLING SOIL, Arizona Water Resources Research Center, Tuc-

son. For primary bibliographic entry see Field 2G.

W75-12050

GEOCHEMISTRY OF STRONTIUM IN THE SCIOTO RIVER DRAINAGE BASIN, OHIO, Miami Univ., Oxford, Ohio, Dept. of Geology

A. M. Stueber, A. D. Baldwin, J. B. Curtis, Jr., P. Pushkar, and J. D. Steele.

Geological Society of America Bulletin, Vol 86, No 7, p 892-896, July 1975, 4 fig. 2 tab, 19 ref. OWRT A-030-OHIO(2).

Descriptors: *Geochemistry, *Strontium, *Ohio, Descriptors: "Geochemistry, "Strontum, "Onio," "Groundwater, "Carbonate rocks, Calcium, Shales, Glacial drift, Bedrock, Radioisotopes, Geologic control, Water chemistry, Spec-trophotometry, Leaching, Sampling, Surface-groundwater relationships, River basins, Water types.
Identifiers: *Scioto River Basin(Ohio), Celestite.

Groundwater that emanates from carbonate bedrock in the Scioto River drainage basin is characterized by Sr87/Sr86 ratios in the range of 0.708 to 0.709; usually high Sr/Ca ratios in this water identify celestite lenses within the carbonate bedrock as the dominant source of strontium. Groundwater from clastic bedrock, principally shale, has Sr87/Sr86 ratios that vary from about 0.710 to about 0.713 and shows low Sr/Ca ratios. Thus, there are two basic groundwater types that emanate from bedrock within the basin. They can be identified by these two parameters. Most groundwater that has been in contact only with glacial till, which covers the northern two-thirds of the basin, has carbonate-type Sr87/Sr86 ratios as well as high Sr/Ca ratios. Celestite is apparently present in the till throughout much of the Scioto Basin. Groundwater that contains celestite-derived strontium, whether from the carbonate bedrock or the till, has so great a strontium content as to control completely the Sr87/Sr86 ratios of surface water northwest of the glacial boundary. This fact limits the usefullness of the Sr87/Sr86 parameter as a tracer in water studies within the basin. (Visocky-ISWS) W75-12052

INORGANICS, (LITERATURE REVIEW),

Tennessee Univ., Knoxville. Dept. of Civil Engincering. For primary bibliographic entry see Field 5A. W75-12072

WATER CHARACTERISTICS, (LITERATURE REVIEW), Maine Univ. Orono.

For primary bibliographic entry see Field 5A. W75-12073

APPLICATION OF THE METHYLTHYMOL BLUE SULFATE METHOD TO WATER AND WASTEWATER ANALYSIS, Ontario Ministry of the Environment, Rexdale,

Water Quality Branch. For primary bibliographic entry see Field 5A. W75-12324

STUDIES IN THE SYSTEM CACO:-FECO3: 1. PHASE RELATIONS; 2. A METHOD FOR MAJOR-ELEMENT SPECTROCHEMICAL ANALYSIS; 3. COMPOSITIONS OF SOME FER-ROAN DOLOMITES, Chicago Univ., Dept. of Geophysical Sciences.

For primary bibliographic entry see Field 2F. W75-12400

Field 2-WATER CYCLE

Group 2L—Estuaries

2L. Estuaries

THE EFFECT OF WIND ON THE SPREAD OF CONTAMINATION IN THE YEISK ESTUARY.

(IN RUSSIAN), For primary bibliographic entry see Field 5B.

SEASONAL PREVALENCE OF CHONDROCOC-CUS COLUMNARIS INFECTION IN BLACK BULLHEADS FROM CLEAR LAKE, IOWA, Iowa State Univ., Ames. Dept. of Zoology and Entomology.

For primary bibliographic entry see Field 5C. W75-11995

HYDROLOGICAL STUDIES OF EVAPOTRANS-PIRATION AND GROUNDWATER FLOW IN SANDY LAND,

National Research Inst. of Agricultural Engineer-

ing, Hiratsuka (Japan). For primary bibliographic entry see Field 2D. W75-12032

DISPERSION AND SETTLING AROUND A WASTE DISPOSAL POINT IN A SHALLOW

Liege Univ. (Belgium). Institut de Mathematique. For primary bibliographic entry see Field 5B. W75-12043

MINI-PROJECT FOR AVON HARBOR,

NORTH CAROLINA, North Carolina State Univ., Raleigh, Center for Marine Coastal Studies.

For primary bibliographic entry see Field 8A. W75-12045

SMALL GROINS ON THE SHORES OF LONG ISLAND SOUND.

New York Ocean Science Lab., Montauk. For primary bibliographic entry see Field 8A.

GROWTH OF THE GREEN ALGA CODIUM FRAGILE IN A CONNECTICUT ESTUARY, Yale Univ., New Haven, Conn. Dept. of Biology For primary bibliographic entry see Field 5C.

EMIGRATION OF THE PEAMOUTH CHUB. MYLOCHEILUS CAURINUS, ACROSS A DILUTE SEAWATER BRIDGE: AN EXPERI-MENTAL ZOOGEOGRAPHIC STUDY, Victoria Univ. (British Columbia). Dept. of Biolo-

gy. D. W. Clark, and J. E. McInerney. Can J Zool., Vol 52, No. 4, p 457-469, 1974.

Descriptors: "Canada, Sea water, "Saline water-freshwater interfaces, Islands, "Barrier islands, "Fish migration, Glaciology, Salinity, Identifiers: British Columbia, "Chub (Peamouth),

Mylocheilus-Caurnius, Vancouver Island (B.C.), Zoo geographic studies, Fraser River (B.C.), Straits of Georgia (B.C.).

In British Columbia, the postglacial distribution of the peamouth chub, M. caurinus, is limited to certain mainland drainages except for several problematical island occurrences, including Vancouver Island (British Columbia, Canada). The saline waters of the 30-mi wide Strait of Georgia evidently act as a barrier to island dispersal. However, during periods of very high runoff from the Fraser River, a corridor of low-salinity water is established between the mouth of the Fraser River and Vancouver Island. For primary-division freshwater fish, the probably constitutes a sweepstakes emigration route consisting of a shallow surface gradient with terminal salinities occasionally falling to levels which peamouth chub can tolerate. In a simulated crossing of Georgia Strait, peamouth chub demonstrated superior survival capabilities in comparison to 3 other freshwater species. The study lends support to the idea that the presence of chub in the Nanaimo River system on Vancouver Island represents a natural postglacial range extension .-- Copyright (c) 1974, Biological Abstracts, Inc. W75-12151

STORM TIDE FREQUENCIES ON THE SOUTH

CAROLINA COAST, National Weather Service, Silver Spring, Md. V. A. Myers

Superintendent of Documents, U.S. Printing Office, Washington, D.C. 20402, for \$1.45. NOAA Technical Report NWS-16 June 1975. 79 p, 33 fig, 8 tab. 43 ref.

*Storm surge, *Tides, *Flood Descriptors: forecasting, Hurricanes, Storms, Climatology, Floods, Disasters, Rainfall, Precipitation(Atmospheric), Ocean waves, Tsunamis, Weather forecasting, Weather, Hydrology, *South Carolina.

Identifiers: Tidal currents, Storm tide frequencies, *Storm tides, Flood Insurance Program, Coastal Hurricane occurrences, Hurricane tides, Flood hazards, Tide frequencies.

Methods are described for estimating hurricane tide frequencies on a coast by applying the National Weather Service hydrodynamic storm surge model to a full set of climatologically representative hurricanes. The first purpose is to provide technical documentation of the coastal tide frequency determination for an area of South Carolina that includes the five maritime counties: Beaufort, Colleton, Charleston, Georgetown, and Horry; the cities of Charleston, Beaufort, Georgetown, and Myrtle Beach; and a number of townships and towns. The second purpose is to describe and illustrate by example the methods used by NOAA for tide frequency determination along any hurricane-prone coastal reach. It provides and explains the basis for hurricane tide frequencies for all of the open coest of South Carolina from an annual probability of occurrence of 0.10 to an annual probability of 0.002 (mean recurrence interval 10 yr. to 500 yr.). The motiva-tion for this report is the Flood Insurance Program which uses the results to define flood risk zones. (NOAA) W75-12160

COOK INLET TIDAL STREAM ATLAS, Inst. of Marine Science. Alaska Univ., College.

J.C.H. Mungall. IMS Report R73-6, Sea Grant Report 73-17, (1973). fig. N00014-67-A-0317-0002 and Grant No. 24 p, 17 fig. 04-3-158-41.

Descriptors: *Tides, *Tidal streams, Descriptors: "Indes, "Inda streams, "Inda streams, "Inda waters, "Currents(Water), "Inlets(Waterways), Ocean currents, Sea level, Water levels, Oceanographic data, Tidal effects, Maps, "Alaske, Hydrologic data, Water level fluctuation.

Identifiers: "Cook Inlet(Alaska), Tidal stream

atlas, Current Atlas, Tide calculations, Current estimations, Current predictions, Current levels, Tidal model, M2 tide, Neap tides, Spring tides, Anchorage currents, Low tides, High tides, Tidal

The purpose of this tidal stream atlas is to provide oceanographers and engineers with a convenient means of estimating currents in Cook Inlet. The currents were computed using a numerical tidal model whose original purpose was that of calculating the distribution of the amplitude and phase of the M2 tide Cook Inlet. The numerical model used as input was for the M2 tide across the seaward entrance of Cook Inlet, and was adjusted so as to give the best possible agreement between the computed and actual amplitude and phase at Anchorage. As the differences between the computed and observed values throughout the rest of the inlet were small (in all cases less than 8% dif-ference in amplitude and in phase) it was decided that the associated current amplitudes and phases would also be reasonably accurate, and would provide information suitable for oceanographic or engincering use. The assumption was made that the ratios between Neap tides and Spring tides to the M2 tide amplitude (0.8 and 1.6 throughout much of Cook Inlet) would hold good also for the currents. Having computed the Neap and Spring currents, it was decided that the most convenient single reference point would be the effective daily tidal range at Anchorage taken from the tide tables. (NOAA) W75-12163

ESTIMATION OF HURRICANE STORM SURGE IN APALACHICOLA BAY, FLORIDA, National Weather Service, Silver Spring, Md. For primary bibliographic entry see Field 2B.

W75-12164

I. P Atkinson

OCEANOGRAPHIC OBSERVATIONS IN THE GEORGIA BIGHT: DATA REPORT FOR R.V. EASTWARD CRUISES E-13-73 (4-11 SEP-TEMBER) AND E-19-73 (8-9 DECEMBER 1973), Skidaway Inst. of Oceanography, Savannah, Ga.

Tech. Rpt. Series No. 75-6 (1975). 156 p, 1 fig, 17 tab. GA-27725; NSF-GX-33615 and NSF-GX-39141; R-800-372.

*Bays, *Topographic mapping. Descriptors: Topography, Hydrology, Hydrography, Oceans, Weather, Temperature, Water temperature, Water, Silicates, Nitrates, Salinity, Chlorophyll, Sampling, Carbon, Zooplankton, Water sampling, Georgia

Identifiers: *Oceanographic observations, *Georgia Bight, Water depth, Dissolved organic carbon, Biological data, Carbon-14, Particulate carbon, Particulate nitrogen, Benthic microinvertebrates, Mercury analysis, Sediment size analy-

Data from Cruise E-13-73 (4-11 September 1973) and Cruise E-19-73 (8-9 December 1973) of the R.V. EASTWARD in the Georgia Bight are presented. Included are the NODC station printouts with the following data: depth, temperature, salinity, oxygen, phosphate, nitrate, silicate, dis-solved organic carbon, weather, ships' position, station time and depth. Biological data include: chlorophyll, carbon-14 primary productivity, particulate carbon and nitrogen, principal zooplankton species and main benthic macroinvertebrates. Sediment size analysis and mercury analysis are also included. (NOAA) W75-12169

STD, CURRENT METER, AND DROGUE OB-SERVATIONS IN ROSARIO STRAIT, JANUARY

National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Environmental Research Labs

J. D. Schumacher, and R. M. Reynolds

Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. NOAA Technical Report ERI. 33-PMEL 24; June 1975, 226 p.

Descriptors: *Current meters, *Currents, *Flow measurement, *Water measurements, Tides, Ocean currents, Temperature, Salinity, T waters, Winds, Water circulation, Washington. Identifiers: *STD observations, Current meter observations, *Drogue observations, *Rosario Straits, STD measurements, Sigma-t data, Tidal data, Wind data.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Water Yield Improvement—Group 3B

Summaries of STD measurements, current meter and drogue data from Rosario Strait and adjacent waters during January to March 1974 are presented as computer-generated plots and as contours of temperature, salinity, and sigma-t. Some tidal and wind data has been included to aid in data interpretation. (NOAA) W75-12175

FEDERAL OCEAN PROGRAMS REVIEW. For primary bibliographic entry see Field 6E. W75-12200

CRITICAL CHOICES SAVE SHORELINE, For primary bibliographic entry see Field 6G. W75-12231

NITROGEN, PHOSPHORUS, AND EUTROPHICATION IN THE COASTAL MARINE ENVIRONMENT,

Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field SC.

ESTUARINE SANCTUARY GRANTS--APPLICA-TION AND SELECTION CRITERIA TION AND PROCEDURES. CRITERIA

National Oceanic and Atmospheric Administration, Rockville, Md.

For primary bibliographic entry see Field 6E. W75-12262

WATER QUALITY AND SALT WATER INTRU-SION IN THE LOWER NECHES RIVER, Lamar Univ. Beaumont, Tex. Dept. of Biology. For primary bibliographic entry see Field 5C W75-12327

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PROCESS FOR DEMINERALIZING WATER, Consiglio Nazionale delle Ricerche, Rome (Italy). (Assignee).

G. Boari, and R. Passino O. Doari, and K. Fassino. U. S. Patent No 3,901,781, 3 p, 3 ref; Official Gazette of the United States Patent Office, Vol 937, No 4, p 1416, August 26, 1975.

Descriptors: *Patents, *Water treatment, *Water pollution control, *Water purification, *Water quality control, *Demineralization, *Pre-treatment (Water), Electrodialysis, Ion exchange, Resins, Cation exchange.

A process for demineralizing water is disclosed which comprises of a combination of a pre-treatment of the water and an electrodialysis process for demineralization. The invention provides a pre-treatment system for the feed water to an elec-tro-dialysis demineralization plant where the water has a suitable alkalinity content. The pre-treatment changes the composition of the materials dissolved in order to reduce concentration and ohmic polarization resistances; to avoid scale formed by alt deposits from the feed water; to remove from sait deposits from the feed water; to remove from the feed water colloidal substances which would otherwise precipitate on the membranes; to raise the density of actual current, increasing the amount of product and decreasing the specific energy and chemical reactant requirements; and to use sulphuric acid also at high concentration, instead of hydrochloric acid, thus enabling an additional economy. The pre-treatment consists in an ion exchange treatment carried out by using ion exchange resins of a cation type to replace in the water to be fed to an electrodialysis process, the hard cations with H+ and Na+ ions, separately or together, using H+ to neutralize the HCO3- ions. The pre-treatment also regenerates the exhausted ion exchange resins. (Sinha-OEIS) W75-12311

ANALYSIS OF REVERSE OSMOSIS FACILI-TIES, GREENFIELD, IOWA,

For primary bibliographic entry see Field 5F. W75-12320

ON THE COMPARISON OF REVERSE OSMO-SIS MEMBRANE PERFORMANCE.

Zagreb Univ. (Yugoslavia). Inst. of Physical Chemistry.

B. Kunst, G. Arneri, and Z. Vainaht. Desalination, Vol 16, No 2, p 169-177, April, 1975. 4 fig, 3 tab, 10 ref.

Descriptors: *Reverse osmosis, *Membrane processes, Analytical techniques, Pressure, Porosity, Physical properties, Performance. Identifiers: Pressure sensitivity.

Methods of comparing the operational performance of different reverse osmosis membranes are analyzed. The inherent porosity of a membrane was shown to affect systematically the ex-tent of concentration polarization at the high pressure side of the film. The development of a proposed method for determining the value of membrane flux needed to compare various mem-branes is documented. It was shown that the inherently more porous Batch 316- and 400-type reverse osmosis membranes do not show im-proved performances at the highest operating pressures (102atm). This is due to the tendency of high pressure to close the small-size pores that are initially generated in these types of membranes. The pressure sensitivity of such membranes, caused by the increased concentration polarization above the more porous membranes, should be considered when comparing the performances of different reverse osmosis membranes. (Kramer-FIRL) W75-12347

3B. Water Yield Improvement

GEOHYDROLOGY OF COLLIER COUNTY,

FLORIDA, Dames and Moore, Park Ridge, Ill. For primary bibliographic entry see Field 4B. W75-11874

GRAPHIC SOLUTION TO FRACTURE TREAT-MENT DESIGN,

Amoco Production Co., Tulsa, Okla. For primary bibliographic entry see Field 8B.

A NEW LOOK AT SANDSTONE ACIDIZING. Exxon Production Research Co., Houston, Tex. For primary bibliographic entry see Field 4B. W75-11878

INNOVATIVE WORKOVER FOR WASSON WATER WELLS,

F. Holasek Water Well Journal, Vol 29, No 5, p 76-77, May,

Descriptors: *Water wells, *Wells, *Water supply, *Specific capacity, *Water yield, Dependable supply, Groundwater, Reservoir supply, Water supply development, Flow rate, Sand aquifer,

Identifiers: Production rate, Gaines County(Tex), Ogallala aquifer.

The Wasson water field, Gaines County, Texas, supplies several major petroleum companies with water for secondary oil recovery processes. The wells produce from the Ogallala and Cretaceous formations at about 200 feet. A recent increase in the production rates of the existing wells was made by removing the gravel packs and washing the formation with a high velocity water-jet con-taining abrasives. Wells treated in this way increased in production considerably. For example, the first well treated increased in production rate from 190 gpm to 650 gpm after treatment. (Bradbeer-NWWA) W75-11890

SOUTHERN NEVADA WATER PROJECT.

Water and Sewage Works, Vol. 120, No. 4, p 68-70, May, 1973, 6 fig.

Descriptors: "Water supply, "Water sources, Water table, Reservoirs, Tunnels, Pumps, Population, Construction, "Nevada, Identifiers: Las Vegas(Nev.), Lake Mead(Nev.).

Between 1960 and 1970 the permanent population of Las Vegas, Nevada increased from 127,000 to 270,000. Under this pressure, the water table was dropping at a rate of 10 feet per year. In some places the ground actually sank. To solve the problem, the Bureau of Reclamation worked with city, state, and federal governments to find a new source of water for Las Vegas and the surrounding area. A 200-foot deep reservoir was blasted from the rock about 1.5 miles from Lake Mead and a lateral tunnel was drilled to connect the new reservoir to the lake. The motors for ten turbine pumps were installed in a building constructed on top of the reservoir. The pumps were lowered 120 feet to lift the water for transportation to the city. The pumps are capable of pumping as much as 200 mgd to the Las Vegas area. The water flows four miles through a 12-foot diameter tunnel through an adjacent mountain range. (Sandoski-FIRL.) W75-11913

THREE-COMPONENT. NONLINEAR

A THREE-COMPONENT, NONLIN WATER-YIELD MODEL, Agricultural Research Service, Athens, Southeast Watershed Research Center. For primary bibliographic entry see Field 2A. W75-12031

WEATHER MODIFICATION: WHERE ARE WE NOW AND WHERE SHOULD WE BE GOING. AN EDITORIAL OVERVIEW,

National Hurricane and Experimental Meteorolo-gy Lab., Coral Gables, Fla.

R. I. Sax, S. A. Changnon, L. O. Grant, W. F. Hitschfield, and P. V. Hobbs.

Journal of Applied Meteorology, Vol 14, No 5, p 652-672, August 1975. 71 ref.

Descriptors: *Weather modification, *Reviews, *Meteorology, Cloud seeding, Artificial precipita-tion, Hail, Fog, Clouds, Cloud physics, Hurricanes, Orography, Water resources, Water supply, Droughts, Water management(Applied), Precipitation(Atmospheric), Political aspects, Agroclimatology, Artificial storms, Research pri-

Identifiers: Inadvertent weather modification, Hail suppression, Orographic precipitation, Convective clouds, Fod modification, Hurricane modification.

Attention was focused on where we are now and where we should be going with respect to several important areas of weather modification. These areas were: (1) inadvertent mesoscale weather and climate modification, (2) hall suppression, (3) weather modification for augmenting orographic precipitation, (4) convective cloud modification, (5) hurricane modification, (6) weather modification for water management, and (7) fog modifica-tion. The discussion was mainly editorial in nature

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and represented the opinions of the authors. It was concluded that considerable progress has been made in weather modification during the past quarter-century. Progress has been slower in some areas than in others, but the overall feeling is optimism-Optimism that the scientific problems of today can be solved by careful research in the future. (Sims-ISWS) W75-12088

ON THE VARIABILITY OF 'DYNAMIC SEEDA-SHILITY AS A FUNCTION OF TIME AND LO-CATION OVER SOUTH FLORIDA: PART I. SPATIAL VARIABILITY,

National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.

W. R. Cotton, and A. Boulanger

Journal of Applied Meteorology, Vol 14, No 5, p 710-717, August 1975. 12 fig, 11 ref.

Descriptors: *Weather modification, *Cloud seed-ing. *Florida, *Sounding. Atmosphere, Cloud physics, Atmospheric physics, Model studies, Mathematical models, Artificial precipitation, Nucleation, Air masses, Temperature, Humidity,

Meteorology.

Identifiers: *Atmospheric soundings, Cumulus

Using a one-dimensional cumulus model, predictions of the effects of seeding cumulus clouds were performed during the month of July 1973 as a part of the Experimental Meteorology Laboratory FACE 1973 Experiment. The calculations were performed with the Miami 1200 GMT soundings and soundings taken in the interior of Florida at 1400 GMT at the so-called Central Site (CS) location. A comparison of 'seedability' predictions using the Miami 1200 GMT and CS 1400 GMT soundings have shown that substantial differences between the two seedability predictions occur on a number of days in spite of the fact that the soundings are separated in time by only 2 h and in space by only 110 km. The differences can be attributed to the frequent intrusion of dry air masses of varying height and thickness. The intensity of the dry layers are generally greatest over the higher-latitude CS location. The greatest differences between the two soundings, and hence the greatest difference between the predicted seeding effects, occurred during periods of transition from a disturbed, westerly flow regime to a well-defined, deep, easterly flow regime. (Sims-W75-12089

A DETAILED MICROPHYSICAL SIMULATION OF HYGROSCOPIC SEEDING ON THE WARM RAIN PROCESS.

South Dakota School of Mines and Technology,

South Datola School of Mines and Technology, Rapid City, Inst. of Atmospheric Sciences. R. D. Farley, and C. S. Chen. Journal of Applied Meteorology, Vol 14, No 5, p 718-733, August 1975. 15 fig. 2 tab, 41 ref, 2 ap-pend. Bureau of Reclamation 14-06-D-6796, NSF GA-36910X.

Descriptors: *Weather modification, *Model studies, *Cloud seeding, Cloud physics, Salts, Mathamatical models, Nucleation, Advection, Condensation, Coalescence, Raindrops, Drops(Fluids),

Artificial precipitation, Precipita-tion(Atmospheric), Meteorology, Identifiers: *Cloud models, Warm rain process, Identifiers: *C Drop breakup.

Wisner one-dimensional time-dependent model has been modified to allow the condensed water forms to be represented by 52 logarithmically spaced size categories covering a range of just under 2 micrometers radius to slightly less than 5 mm radius. The size distribution of the water drops was allowed to evolve with time as a result of the physical processes of vertical advec-tion, condensation/evaporation, stochastic coalescence, and drop breakup. Salt seeding was

simulated by introduction of a distribution of raindrop embryos at cloud base for a specified period of time. The raindrop embryo distribution was derived from calculations on the diffusional growth of a distribution of salt particles in the unsaturated air below cloud base. This model was apsaturated all octow todd oase. This model was applied to the 23 July 1970 salt seeding case near Rapid City. This 'detailed microphysical' study has indicated that salt seeding can be effective in stimulating the warm rain process only if breakupinduced chain reactions result. In order for the chain reaction to develop, high vertical velocities (greater than 10 m/s) are required. Salt seeding acts mainly as a catalyst in initiating this Lang-muir-type chain reaction. Without breakup, salt seeding has little effect other than to allow a few of the big drops to fall out of the model clouds. Breakun acting alone may cause the model clouds to precipitate but much longer periods are required than when seeding and breakup are combined. The effects of salt seeding and breakup-induced chain reactions are also strongly dependent on the dynamics of the model cloud. (Sims-ISWS) W75-12090

FLORIDA AREA CUMULUS EXPERIMENTS 1970-1973 RAINFALL RESULTS, Virginia Univ., Charlottesville. Dept. of Environ-mental Sciences; and Virginia Univ., Charlot-J. Simpson, and W. L. Woodley.

Journal of Applied Meteorology, Vol 14, No 5, p

734-744, August 1975, 16 fig. 9 tab, 26 ref.

Descriptors: *Weather modification. *Cloud seed-Descriptors: "Weather modification, "Cloud seeding, "Artificial precipitation, "Florida, Rainfall, Clouds, Cloud physics, Silver iodide, Mathematical models, Networks, Rain gages, Radar, On-site investigations, Sampling, Analytical techniques, Evaluation, Meteorology. Identifiers: *Cumulus clouds, Cloud mergers

After four summer periods of randomized experimentation with dynamic cumulus seeding in a 13,000 sq km target area in south Florida, 14 seed and 23 control cases are available, with increased documentation of radar measurement accuracy. Seed-control rainfall comparisons are made 'floating' and total target for the 6 hour period fol-lowing the first seeding. On days screened as suitable for the experiments, natural rain volume varied by a factor of 62 for floating target and by a factor of 25 for total target. Area seed-control rainfall dif-ferences are not significant with six classical tests, nor is the difference between random and non-random controls. Analysis of isolated experimental clouds obtained on days of multiple cloud seeding produced significant findings. Results were stratified depending on whether the single clouds dissipated in the target area without merger or whether they merged with a neighbor. With the former stratification, the mean seeded rainfall ex-ceeded the mean control rainfall by a factor of 2, a result that is consistent with earlier single cloud studies. No meaningful rainfall comparison was possible with the latter stratification because, on the average, the seeded clouds merged (and were dropped) 13 min earlier than the controls. This disparity in mean lifetimes before merger suggests that seeding is promoting merger in Florida Area Cumulus Experiments as intended. (Sims-ISWS) W75-12091

SMALL-SCALE VARIABILITY OF HAIL AND ITS SIGNIFICANCE FOR HAIL PREVENTION EXPERIMENTS.

EAPPERIMENTS, G. M. Morgan, Jr., and N. B. Towery. Journal of Applied Meteorology, Vol 14, No 5, p 763-770, August 1975. 12 fig, 3 tab, 20 ref. NSF GI-

Descriptors: "Hail, "Variability, "Weather modifi-cation, "Illinois, Areal, Size, Distribution pat-terns, Sampling, On-site investigations, Networks, Measurement, Crops, Damages, Statistics, Crops, Meteorology

Identifiers: *Hail variability, Hail suppression, Hailswaths

Studies of small-scale variability of hailfall parameters are being pursued using fine-scale net-works of passive hail sensors of various designs. These studies have revealed the great variability which exists in objective hail parameters over very short distances. The objective of the fine-scale measurements is to eventually produce a statistical hailstreak model with which to assess the uncertainty produced by making areal hail estimates with coarse networks as part of hail prevention ex-periments. An example of such an assessment for a single hailstreak crop-loss pattern illustrated the problem and demonstrated that, for the particular damage pattern used, a square grid with 1 mi spacing would estimate the areal damage within 25% accuracy 80% of the time. (Sims-ISWS) W75-12092

FORMATION OF GRAUPEL.

Naval Weapons Center, China Lake, Calif. R. F. Reinking.

Journal of Applied Meteorology, Vol 14, No 5, p 745-754, August 1975, 7 fig. 4 tab, 23 ref. Bureau of Reclamation 14-06-D-6592.

Descriptors: *Graupel, *Rime, *Cloud physics, *Weather modification, Snow, Crystals, Size, Growth rates, Clouds, Sampling, Analytical techniques, Cloud seeding, Meteorology, *California. Identifiers: *Sierra Nevada(Calif).

Measurements were made of the sizes and concentrations of graupel and snow crystals occurring in seeded and untreated winter storms of the Sierra Nevada. The amounts of rime on individual snow crystals were also determined. The observations show that crystal riming, and formation and precipitation of graupel, are common to all stages of Sierran snowstorms. Graupel occurs simultaneously with all types of snow crystals, but in-dividual crystal types do not consistently occur with or serve as kernels for particles of graupel. Graupel particles do not develop predominantly on kernel snow crystals that grow to relatively large sizes over relatively long periods by deposition and accretion. Graupel often forms instead on a select few small crystals, when it forms utilizing setect few small crystals, when it forms utilizing regular crystals as kernels. Graupel frequently develops without kernels, by alternate riming processes. One possible alternative is a mechanism that produces graupel from rime accumulated at localized points on parent snow crystals. (Sims-ISWS)
W75-12093

HAIL SUPPRESSION DATA FROM WESTERN NORTH DAKOTA, 1969-1972,

South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
J. R. Miller, Jr, E. I. Boyd, R. A. Schleusener, and

A. S. Dennis

Journal of Applied Meteorology, Vol 14, No 5, p 755-762, August 1975, 5 fig, 10 tab, 13 ref. Bureau of Reclamation 14-06-D-6660.

Descriptors: *Weather modification, *Hail,
*Artificial precipitation, *North Dakota, Cloud Descriptors: seeding, Crops, Damages, Silver iodide, Thun-derstorms, Storms, Precipitation(Atmospherie), Analytical techniques, Meteorology, Identifiers: *Hail suppression, Crop damage, Crop-hail losses.

Four seasons of hail data were gathered on a randomized cloud seeding project aimed at reducing hail damage and increasing rainfall in western North Dakota. Hail on seed days was generally less severe than on no-seed days. Statistical tests of data from passive hail indicators do not permit rejection of the null hypothesis at the 90% confidence level, but application of rank tests to crophail insurance loss data indeated that the seeding

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reduced crop damage from hail. Post-analyses of related data indicated that: (1) the ratio of rainfall amount to hail energy was greater for seed days than no-seed days, and (2) radar characteristics of seeded storms differ from those of unseeded storms. In addition, case studies of 34 storms indicated that damaging hail was usually suppressed when their updraft areas were seeded continuously. (Sims-ISWS) W75-12094

DESIGN OF A HAIL SUPPRESSION PROJECT FOR ILLINOIS,

Bilinois State Water Survey, Urbana. S. A. Changnon, G. M. Morgan, Jr., G. L. Achtemeier, N. G. Towery, and R. C. Grosh. Journal of Applied Meteorology, Vol 14, No 5, p 771-782, August 1975. 6 fig. 3 tab, 19 ref. NSF GI-

Descriptors: *Weather modification, *Hail, *Projects, *Illinois, Social aspects, Silver iodide, Economics, Research facilities, Forecasting, Sampling, On-site investigations, Operations, Cloud seeding, Planning, Feasibility studies, Meteorology, dentifiers: *Hail suppression, *Project design.

A broad program to Design and Experiment to Suppress Hail (DESH) in Illinois was described. This program draws on results acquired during 17 years of extensive hail research in Illinois. The principal task of DESH is to determine the desirability and the feasibility of hail suppression experimentation in Illinois and the Midwest. Socio-conomic studies have led to an affirmative conclusion on the desirability issues. The feasibility decision appears affirmative and rests on certain key results. Airborne cloud base seeding in the humid midwestern environment is possible but will be more difficult and expensive than in less humid areas. Radar will be needed for short-term forecasting, aircraft operations, identification of potential hail-storms, and in the evaluation of seeding effectiveness. Weather forecasting by objective techniques will be valuable in both operations and evaluation, and adequate objective techniques have been largely developed. The overall shape of the proposed evacuration is not the proposed evacuration and control of the proposed evacuration and control of the proposed evacuration and evaluation.

fort, which will make assessments of societal, environmental, and economic impacts and commicate with the public; an operational effort to execute the experiment according to the final detailed design; and an evaluation effort combining a variety of surface, synoptic, and radar data to assess the efficacy of the chosen seeding technique. (Sims-ISWS) W75-12095

overall shape of the proposed experiment is now clear. It will consist of an impact monitoring ef-

THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING. PART I: NATURAL CONDITIONS.

Washington Univ., Seattle. Dept. of Atmospheric Sciences. P. V. Hobbs.

P. V. Hobbs.

Journal of Applied Meteorology, Vol 14, No 5, p 783-804, August 1975. 25 fig, 3 tab, 23 ref. Bureau of Reclamation 14-06-D-6999, NSF GA-17831, GI-31759.

Descriptors:

*Clouds,
*Precipitation(Atmospheric),
*Snow,
*Washington, Winter, Weather, Weather data,
Mountains, Data collections, On-site investigations, Moisture content, Cloud physics, Sampling,
Sounding, Ice, Graupel, Crystals, Rime,
Fronts(Atmospheric), Atmosphere,
Meteorology,
Identifiers: *Cascade Mountains.

This is the first of three papers describing and evaluating field investigations, carried out from 1969 to 1974, of winter clouds and precipitation in

the Cascade Mountains of Washington State and their modification by artificial seeding. Airborne and ground observations of the natural clouds and precipitation were described here. It was observed that: (1) in pre-frontal conditions ice particles dominate over water droplets above the -10C level, but the ratio of ice to water is lower in postfrontal conditions; (2) the passage of an occluded or warm front causes a sharp lowering of the diffusional growth layers of the ice crystals, so that particles reaching the ground change from unrimed crystals which grow at low temperatures to rimed crystals which form a higher temperatures; (3) the maximum ice particle concentrations in the clouds are often several orders of magnitude greater than measurements of ice nuclei would suggest; (4) the growth of precipitation particles by riming and aggregation is particularly rapid in the last kilometer of fall; (5) snow particles reaching the ground originate 10 to 100 km upwind; and (6) on the western slopes of the Cascades the degree of riming and precipitation rates increase with increasing wind speed and water vapor content at 3 km, but this is not the case on the eastern slopes of the Cascades. (Sims-ISWS) W75-12096

A NUMERICAL MODEL OF PRECIPITATION FROM SEEDED AND UNSEEDED COLD ORO-GRAPHIC CLOUDS

GRAPHIC CLOUDS, Denver Research Inst., Colo. M. N. Plooster, and N. Fukuta. Journal of Applied Meteorology, Vol 14, No 5, p 859-867, August 1975. 4 fig, 3 tab, 17 ref. Bureau of Reclamation 14-06-D-7048, NSF GI-39849.

Descriptors: *Weather modification, *Cloud seeding, *Model studies, *Mathematical models, Artificial precipitation, Cloud physics, Air circulation, Silver iodide, Nucleation, Computer models, Simulation analysis, Meteorology.

Identifiers: *Orographic clouds, Flow models,

Cloud physics models, Seeding rates

A numerical model of ice-phase precipitation from orographic clouds which includes the effects of seeding the artificial ice nuclei was described. The model described the events which take place when a layer of moist air of near-neutral stability, overlain by a more stable dry layer, flows over a mountain ridge. A two-dimensional, steady-state model of the flow in the vertical plane normal to the ridge furnished a field of the flow streamlines along which microphysical processes are followed. The cloud physics model described the formation of the supercooled cloud, the formation of ice particles from both natural and artificial ice nuclei, and the growth and precipitation of ice particles. Growth by both vapor deposition and riming were included. Artificial ice nuclei were released from a localized source at ground level. A simple Fickian diffusion process was used to describe the vertical transport of nuclei to the cold upper region of the cloud. The model calculated the rate of precipitation at ground level as a function of horizontal position. The dependence of precipitation efficiency on cloud top temperature was in good agreement with field observations from the Climax experiment. Substantial precipitation increases were produced by seeding clouds whose natural precipitation efficiences are low. However, it was shown that the seeding rate required to produce a given increase in precipitation rate is a strong function of cloud temperature. The model also showed that precipitation rates depend upon the activity of the ice nuclei as a function of tempera-ture. (Sims-ISWS) W75-12098

TESTING OF CLOUD SEEDING MATERIALS AT THE CLOUD SIMULATION AND AERSOL LABORATORY, 1971-1973, Colorado State Univ., Fort Collins. Dept. of At-

Colorado State Univ., Fort Collins. Dept. of A mospheric Science.

D. M. Garvey.

Journal of Applied Meteorology, Vol 14, No 5, p 883-890, August 1975. 9 fig. 2 tab, 3 ref. NSF GI-32894X2

Descriptors: *Weather modification, *Cloud seeding, *Nucleation, *Testing, Evaluation, Testing procedures, Analytical techniques, Instrumentation, Research facilities, Crystals, Aerosols, Iodides, Silver iodide, Cloud physics, Meteorolo-

Identifiers: *Cloud chambers, Ammonium iodide.

Developments in instrumentation at the Cloud Simulation and Acrosol Laboratory at Colorado State University since the Second International Workshop on Condensation and Ice Nuclei were outlined. Emphasis was given to improvements in the isothermal cloud chamber and the current status of a second-generation, controlled slow-ex-pansion cloud chamber in which ascent of an air parcel may be simulated. Work with the aerosol dilution system (wind tunnel) was also described. Tests conducted during the three years 1971 theoretically and the statement of the through 1973 to determine the ice nucleus production of many currently used cloud-seeding devices were summarized. Effectiveness curves for nine ground-based steady-state generators burning various solutions of AgI-NH4I and AgI-NaI in acctone were presented. Test results for three airborne generators were also given and contrasted with the results for the ground generators. Finally, effectiveness values were presented for a number of pyrotechnics manufactured by Olin, Colspan, Sierra Research, and Naval Weapons Center. The need for caution in the use of such effectiveness curves in the design of weather modification experiments was stressed. It is believed that optimal 'dosages' of artificial nuclei for natural clouds can be determined using cloud chamber measure-ments. But probable differences in cloud characteristics and acrosol residence times both in cloud and in transit to cloud must be taken into account. Such considerations, together with a more accurate simulation of operational conditions of ventilation for different cloud-seeding devices, stitute a major thrust of current research effort at the Simulation Laboratory. (Sims-ISWS)

AN EXPLANATION FOR THE UNUSUAL NUCLEATING ABILITY OF AEROSOLS PRODUCED FROM THE AGI-NH4I-ACETONE SYSTEM,

South Dakota School of Mines and Technology, Rapid City, Inst. of Atmospheric Sciences. B. L. Davis, L. R. Johnson, and F. J. Moong, Journal of Applied Meteorology, Vol 14, No 5, p 891-896, August 1975, 4 fig. 4 tab, 18 ref. NSF GI-34806.

Descriptors: *Nucleation, *Cloud seeding, *Weather modification, Silver iodide, Aerosols, Chemistry, Cystallography, Ice, Crystals, Ammonium compounds, Iodides, Laboratory tests, Meteorology.

Identifiers: *Ammonium iodide, Acetone.

The exceptional ice nucleating ability of aerosols obtained from combustion of AgI-NH4I-acetone solution is now well known. The high nucleating ability has been determined to come from the existence of a complex compound having a better expitaxial fit with respect to ice than has silver iodide. The compound has a stability region which includes the temperature interval of -20 to +9C at water saturation and has been observed to be present on AgI aersol particles produced from standard aircraft seeding generators in a wind tunnel dilution system. Its presence is presumed to occur as a result of incomplete destruction of the NH4(+) of the original solution. Although the unit cell of the phase is monoclinic, e-centered, it has a close packed structure nearly identical to silveriodidie in the ao-bo crystallographic plane. In this plane the phase has a misfit with respect to the basal plane of ice of 1.3% at -7C as compared to 1.5% for silver iodide. The composition of the

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phase is 3AgI-NH4I-6H2O but with 25% of the silver positions being vacant on the average. Compositions of 2:1 mole ratio AgI:NH4I can also exist in an apparent metastable state. The threshold of ice nucleation for the pure B sub n phase was found to be -IC as contrasted to the recognized -4C threshold for silver iodide. (Sims-ISWS) W75-12100

ANALYSIS OF RADAR OBSERVATIONS OF A RANDOMIZED CLOUD SEEDING EXPERIMENT

South Dakota School of Mines and Technology, Rapid City, Inst. of Atmospheric Sciences. A. S. Dennis, A. Koscielski, D. E. Cain, J. H. Hirsch, and P. L. Smith, Jr.

Journal of Applied Meteorology, Vol 14, No 5, p 897-908, August 1975. 7 fig, 9 tab, 11 ref. Bureau of Reclamation 14-06-D-6796.

Descriptors: *Weather modification, *Cloud seeding, *Artificial precipitation, Analytical techniques, Rainfall, Storms, Radar, Aircraft, Remote sensing, Silver iodide, Sodium chloride, Mathematical models, Correlation analysis, Regression analysis, Projects, Project planning, Meteorology.

Magnetic tape records for radar observations of 80 moving one-hour test cases in a three-way ran-domized (no-seed, salt, silver iodide) cloud seeding experiment have been analyzed in terms of ing experiment nave been analyzed in terms of cehoing areas and radar-estimated rainfall amounts. Individual test cases ranged from non-precipitating cumulus up to moderate thunderstorms with echoing areas exceeding 100 sq km and rainfall estimated at 3000 kT in 1 hour. Out of numerous predictor variables, cloud depth was found to be the best single predictor for both echoing area and radar-estimated rainfall. The echoing area and radar-estimated rainfall were very closely correlated. A cube-root transformation of the radar-estimated rainfall improved the correlation between cloud depth between cloud depth and the radar-estimated rainfall for the no-seed (control) sample to 0.91. For clouds of a given depth, both the echoing area and radar-estimated rainfall were larger in seeded than in unseeded cases. The differences between no-seed and salt cases were of marginal statistical significance, but the dif-ferences in echoing area and rainfall between noseed and silver iodide cases were significant at the 1% level. The indicated effects, expressed as a percentage of the echoing area or radar-estimated rainfall in the no-seed cases, decreased with cloud depth. A comparison of no-seed and AgI cases with the aid of a one-dimensional steady-state cloud model showed that AgI seeding may have led to increases in maximum cloud height averag-ing 600 m. It was concluded that seeding affected the precipitation in the Cloud Catcher test c through both the microphysical processes and the cloud dynamics. (Sims-ISWS) W75-12101

ON THE EFFECT OF NATURAL RAINFALL VARIABILITY AND MEASUREMENT ERRORS IN THE DETECTION OF SEEDING EFFECT,

Battelle-Northwest, Richland, Wash. A. R. Olsen, and W. L. Woodley. Journal of Applied Meteorology, Vol 14, No 5, p 929-938, August 1975. 3 fig, 4 tab, 11 ref.

Descriptors: "Rinfall, "Variability, "Measurement, "Florida, Radar, Remote sensing, Rain gages, Cloud seeding, Weather modification, Precipitation(Atmospheric), Rain, Areal, Rain-fall disposition, Statistics, Meteorology. Identifiers: "Measurement errors, Seeding effects.

Natural rain variability and measurment errors are obstacles to the determination of the seeding effect in convective cloud seeding experiments. The relative importance of these problems in Florida was evaluated. The major thrust of the work was embided in a computer simulation of area cloud

UMI

seeding experiments for two areas (570 sq km and 13,000 sq km) using field measurements as input. The effect of natural rain variability was studied as it related to the power functions of selected statistical tests for seeding effect. Measurement errors for gage and radar systems were introduced by modifying the underlying distribution of area mean rainfall. For the two Florida areas, natural rain variability is by far the major obstacle to the determination of a seeding effect. Errors are of lesser importance for the system of rain measurement used in Florida, which involves radar-rain estimates adjusted by gages. With a less accurate system of rain measurement, errors would assume greater relative importance. It was concluded that to detect a particular seeding effect with a minimum number of cases, the importance of natural rain variability must be decreased through either stratification of the experimental days or through meteorological predictors. The measure-ment system used by the Experimental Meteorology Laboratory is adequate for the evaluation of its seeding experiments and little will be gained through the expenditure of time and effort to improve it further. (Sims-ISWS) W75-12103

THE EFFECT OF PERSISTENCE OF AGI ON RANDOMIZED WEATHER MODIFICATION EXPERIMENTS.

Bureau of Reclamation, Denver, Colo. D. Rottner, S. R. Brown, and O. H. Foehner. Journal of Applied Meteorology, Vol 14, No 5, p 939-945, August 1975. 5 fig, 2 tab, 17 ref.

Descriptors: *Weather modification, *Cloud seeding, *Silver iodide, *Persistence, *Colorado, *New Mexico, Rainfall, Precipitation(Atmospheric), Ice, Nucleation, Statistics, Statistical methods, Evaluation, Aircraft, Rain gages, Atmosphere, Sounding, Mountains, Meteorology.

Meteorology.

The hypothesis was tested that AgI may persist for long periods of time and contaminate control experimental days when these control days im-mediately follow a seeded day. When the first 6hour periods of all such potentially contaminated days were placed in the seeded population for two randomized weather modification experiments, the Colorado River Basin Pilot Project in the San Juan Mountains and the Jemez Atmospheric Water Resources Research Project, a statistically significant seeding effect was detected. When the first 6-hour periods were not included in either population a significant seeding effect was also detected. However, when the possibly contaminated periods were included in the control population, an inconclusive seeding effect was noted. Support for the hypothesis was obtained by making aircraft measurements of ice nuclei on days following seeded days in the San Juan experiment. Ice nuclei counts of 2 to 3 orders of magnitude above background were found under certain conditions. (Sims-ISWS) W75-12104

ON THE DESIGN AND EVALUATION OF CU-MULUS MODIFICATION EXPERIMENTS,

Virginia Univ., Charlottesville. Dept. of Environmental Sciences; and Virginia Univ., Charlottesville. Center for Advanced Studies. J. Simpson, J. C. Eden, and A. R. Olsen. Journal of Applied Meteorology, Vol 14, No 5, p 946-958, August 1975. 20 fig, 9 tab, 24 ref.

Descriptors: *Weather modification, *Cloud seeding, *Evaluation, *Florida, Statistics, Project planning, Rainfall, Precipitation(Atmospheric), Measurement, Simulation analysis, Mathematical models, Probability, Frequency analysis, Histograms, Meteorology. Identifiers: *Seeding effects, Cumulus clouds.

Combination of numerical simulation, many simultaneous measurements, and a large assortment of statistical tools employed at all stages have been found useful in design and evaluation of modifica-tion experiments on cumulus clouds. A randomized sample is essential, although non-random controls have supplemented it by providing necessary information on natural distributions. A 26 pair data set from a dynamic seeding experiment on isolated Florida cumuli was used here. Numerical simulation of seeded and unseeded cumulus towers defined the key screening variable 'seedability,' namely the predicted height dif-ference between seeded and unseeded towers, so that only days on which the physical seeding hypothesis would be expected to work were selected for experimentation. On those days, randomization was between clouds selected by the experimenters as suitable. Classical and Bayesian statistics were used together in the evaluation, with both univariate and multivariate analyses. Various well-known probability density distributions fitted the seeded and unseeded rainfalls. Among the best were gamma, log-normal, beta-K and beta-P. Seed-control differences were examined with nonparametric and parametric tests (some of the latter after data transformation) and effects of random and systematic measurement er-rors were considered. In all tests, the seed-control rainfall difference was significant at better than 5%. A multiplicative seeding factor of 2-3 was estimated in several ways (allowing for or getting around the bias problem with ratio estimators related to long-tailed distributions). (Sims-ISWS)

EVALUATION BY MONTE CARLO TESTS OF EFFECTS OF CLOUD SEEDING ON GROWING SEASON RAINFALL IN NORTH DAKOTA,

South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences. A. S. Dennis, J. R. Miller, Jr., D. E. Cain, and R. I.

Schwaller, J. R. Smitt, St. D. L. Cain, and R. R. Schwaller. Journal of Applied Meteorology, Vol 14, No 5, p 959-969, August 1975. 3 fig. 7 tab, 12 ref. Bureau of Reclamation 14-06-D-6660.

Descriptors: *Weather modification, *Cloud seeding, *Evaluation, *North Dakota, Projects, Data processing, Monte Carlo method, Stratification, Statistics, Statistical methods, Rainfall, Artificial precipitation, Precipitation(Atmospheric), Silver iodide, Radar, Rain gages, Hail, Meteorology.

Rainfall data collected at 67 gages in a 2750 sq mi target area during a 4-year randomized cloud sceding experiment in North Dakota have been stratified in a variety of ways and subjected to statistical tests. Some stratifications related to cloud model predictions were possible for only the last two years when a rawinsonde station was operated as part of the project. Monte Carlo experiment simulating 500 reruns of the 4-year experiment have been used to establish significance levels for the tests within each data stratification. The analysis provided significant evidence that seeding convective clouds on a determinate set of days leads to: (1) an increase in the frequency of rainfall events at the individual target gages, (2) an increase in the average rainfall recorded per rainfall event, and (3) an increase in total rainfall on the target. This evidence applied to those days with dynamic seedability; that is, days for which a cloud model predicted an increase in cloud top height under the influence of silver iodide seeding. Rainfall observations on days when the cloud model predicted no increase in cloud height showed no significant differences between seed and no-seed days. There was no obvious bias to account for the significant differences between seed and no-seed days with dynamic seedability. It was tentatively concluded that dynamic effects, including rainfall increases, were produced by light to moderate silver iodide seeding from below cloud base. The potential rainfall increase resulting from seeding below selected clouds on days with dynamic seedability was estimated at one inch per growing season. (Sims-1SWS)

W75-12106

BAYESIAN AND CLASSICAL STATISTICAL METHODS APPLIED TO RANDOMIZED WEATHER MODIFICATION EXPERIMENTS, Battelle-Northwest, Richland, Wash. A. R. Olsen.

Journal of Applied Meteorology, Vol 14, No 5, p 970-973, August 1975. 7 ref.

Descriptors: *Weather modification, *Cloud seeding, *Evaluation, *Statistics, Statistical methods, Data processing, Rainfall, Artificial precipitation, Precipitation(Atmospheric), Mathematics, Mathematical models, Statistical models, Meteorology, Stochastic processes

Identifiers: *Randomized experiments, Bayesian

Statistical procedures for analyzing the results of randomized weather modification experiments were presented in a format designed to emphasize their underlying assumptions. A parallel develop-ment of Bayesian and classical statistical techniques was given to demonstrate that both methodologies can be used under tye assumed ex-perimental conditions and that the difficulties in applying either are comparable. (Sims-ISWS) W75-12107

THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUN-TAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING. PART II: TECHNIQUES FOR THE PHYSICAL EVALUATION OF SEED-

Washington Univ., Seattle. Dept. of Atmospheric

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P. V. Hobbs, and L. F. Radke. Journal of Applied Meteorology, Vol 14, No 5, p 805-818, August 1975. 12 fig, 1 tab, 28 ref. Bureau of Reclamation 14-06-D-6999, NSF GA-17381, GI-

Descriptors: *Weather modification, *Cloud seeding, *Evaluation, *Washington, Mountains, Winter, Sampling, Aircraft, Radar, Instrumenta-tion, Measurement, Equipment, Cloud physics, Snow, Crystals, Ice, Precipitation(Atmospheric), On-site data collections, Silver iodide, Nucleation, Meteorology. Identifiers: *Cascade Mountains.

Airborne, ground, and radar techniques used for evaluating the effects of artificial seeding on winter clouds and precipitation over the Cascade Mountains were described. The clouds were seeded for 1 or 2 hr with silver iodide and/or dry ice dispersed from an aircraft at locations which particle trajectory analysis, based on field data, indicated would affect precipitation in a small (90 sq km) predetermined target area straddling the Cascade crest. The effects of seeding on the clouds were determined from the aircraft through visual observations, ice nuclei measurements, and resaurements of the type and concentrations of cloud particles. A Doppler radar located near the Cascade crest was used to measure the spectra of fallspeeds of the precipitation particles. At manned stations within the target area on the ground, measurements and observations were made before, during, and after seeding of precipitation rates; the types, concentrations, and degrees of riming of snow crystals; and the concentrations of freezing nuclei and silver in the snowfall. The effects of heavy seeding on the clouds were generally pronounced and measurable. Good physical evidence for artificial modifications of snowfall on the ground within the target area was not as common, but was obtained in a number of detailed case studies. (See also W75-12109) (Sims-ISWS) W75-12108

THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY ARTIFICIAL SEEDING. PART III: CASE STUDIES

OF THE EFFECTS OF SEEDING, Washington Univ., Seattle. Dept. of Atmospheric

Journal of Applied Meteorology, Vol 14, No 5, p 819-858, August 1975, 50 fig, 10 tab, 11 ref. Bureau of the Reclamation 14-06-D-6999, NSF GI-17381, GI-31759

Descriptors: *Weather modification, *Cloud seeding, *Washington, Sampling, Aircraft, Evaluation, Measurement, Mountains, Winter, Snow, Precipitation(Atmospheric), Artificial precipitation, Crystals, Rime, On-site data collections, Silver iodide, Nucleation, Cloud physics, Meteorology.
Identifiers: *Cascade Mountains, *Case studies.

Three case studies were described to evaluate the effects of artificial seeding from the air on cloud structure and snowfall on the ground in a small predetermined target area in the Cascade Mountains. On January 31, 1972, stratocumulus clouds just west of the Cascade crest were heavily seeded with silver iodide for 72 min. Airborne observations showed that the clouds were glaciated by the artificial seeding, new crystal types appeared, and there was an increase in convective activity. On the ground in the target area new snow crystal types appeared, riming decreased, freezing nuclei in the snowfall increased, and the snowfall rate decreased during the predicted period-of-effect (PPE) of seeding. Stratocumulus clouds over the Cascades were heavily seeded with silver iodide and dry ice for 77 min on January 19, 1973. Clouds, glaciated by the seeding, were tracked over the target area from the aircraft. A 2.5-fold and 10-fold increase in precipitation occurred in the target area at Snoqualmie Pass and Kachess Dam, respectively, during the PPE. At the same time the amounts of silver in the snowfall increased. Twenty-six cumulus clouds over the Cascades were seeded with silver iodide on March 27, 1973. There were sharp increases in the ice content of these clouds and increases in the ice content of these clouds and snow fell from them over the target area during the PPE, causing snow showers at Snoqualmic Pass and Hyak. These detailed physical evaluations support preictions, based on observations of the natural clouds and precipitation and theoretical-computations, that snowfall across the Cascade Mountains can be redistributed and increased by artificial seeding. (See also W75-12108) (Sims-ISWS) W75-12109 W75-12109

METHOD OF CLEANING AND STIMULATING A WATER WELL, J. D. Jenkins

US Patent No 3,899,027, 3 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 507, August 12, 1975.

Descriptors: *Patents, *Water wells, *Water supply, *Water yield improvement, Water reuse, Aquifers, Well casings, Impaired water use, Recirculated water, Chemicals, Water level, Recycling,

A system is described for cleaning and benefitting of wells which relies on a recycling of the fluid from the well pump whereby the entire discharge from the pump is recycled through the well and surrounding aquifer along with selectively in-troduced solutions. The invention provides for precise amounts of chemical additives to be introduced with the concentrations being cycled through the well while being accurately controlled. This apparatus is mounted on the well without removing or in any way interfering with the pump apparatus or related equipment by extending a recycle line from the pump discharge to the well casing below the pump apparatus. The entire inner surface of the casing, as well as the inner and outer

surfaces of the well column and the surrounding aquifer are subjected to the cleaning action. The free falling of the pump fluid back down the well casing impacts with the water standing in the lower casing impacts with the ward standard in the love-portion of the casing and generates substantial shock wave energy which is transmitted to the sur-rounding aquifer, producing a cleaning action which stimulates the well and improves the yield. W75-12301

3C. Use Of Water Of Impaired **Ouality**

SPRAY IRRIGATION OF TREATED MU-

NICIPAL SEWAGE, British Columbia Univ., Vancouver, Dept. of Civil Engineering. For primary bibliographic entry see Field 5D. W75-11856

RECYCLING ALLOWS ZERO WASTEWATER DISCHARGE.

Black, Crow, and Eidsness, Inc., Clearwater, Fla. For primary bibliographic entry see Field 5D, W75-12364

3D. Conservation In Domestic and Municipal Use

RECIRCULATING RESIN CLEANING CHEMI-CAL FEEDER SYSTEM FOR WATER SOF-TENERS,

J. L. Williams

US Patent No 3,899,422, 4 p. 5 fig. 4 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 632, August 12, 1975.

Descriptors: "Patents, "Water softening, "Water treatment, "Impaired water quality, "Water quality control, Filters, Ion exchange, Cleaning, Equipment, Recycling. Identifiers: Backwash, Regeneration.

This invention provides an improved backwash system in water softeners which incorporates a crubbing and cleaning action within a separate cleaning tube where the particles not only move along with the liquid flow which sets them in motion, but are specifically passed through the jet ac-tion flow of liquid so as to substantially enhance the cleaning action. In addition is the incorporation of a feeder for chemical additives also under the control of the flow inducing jet stream or liquid discharge. The apparatus includes an elongated cleaning tube fixed to the service tube along a substantial portion of its length within the filter bed. This cleaning tube is open at the top and bottom for a flow of the particulate filter material. The discharge end of a feed line connects with the cleaning tube below the upper intake end. A flap valve is so oriented as to, during the normal or water softening cycle, effectively seal the port and during the backwash operation are uately flare open into the cleaning tube so as to provide a jet distribution of the liquid from the service tube diagonally across the cleaning tube covering the full cross-sectional area. The flow in the cleaning in a circulating manner and actually passing directly through the jet flow of the cleaning liquid and being subjected to the action of the chemical additive. (Sinha-OEIS) W75-12307

WATER QUALITY MANAGEMENT IN A METROPOLITAN AREA, British Columbia Univ., Vancouver. Westwater

Research Centre.
For primary bibliographic entry see Field 5G.
W75-12354

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3E - Conservation In Industry

3E. Conservation In Industry

WATER RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION WYOMING, MONTANA, AND NORTH DAKOTA, 1975.
Geological Survey, Denver, Colo.

Resources Div.

For primary bibliographic entry see Field 5A. W75-11961

HYGIENIC EFFECTIVENESS OF MEASURES FOR TREATING THE INDUSTRIAL WASTE-WATERS OF THE KONAKOVO STATE RE-GIONAL ELECTRIC POWER PLANT, (IN RUS-

Epidemiology Station, Konakovo (USSR).

For primary bibliographic entry see Field 5D. W75-11984

APPLICATION OF A SIMPLE DISPERSION MODEL TO A RURAL INDUSTRIAL REGION, National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab. For primary bibliographic entry see Field 5A. W75-12037

RECOVERING PROTEINS FROM WASTE WATER.

Secretary of Agriculture, Washington, D.C. (assignee). For primary bibliographic entry see Field 5D. W75-12057

POWER CONVERSION APPARATUS FOR UTILIZING THE FORCE OF WAVES, D. K. Lockhart.

US Patent No 3,896,625, 3 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 936, No 5, p 1605, July 29, 1975.

*Patents. Descriptors: *Ocean *Waves(Water), *Energy conversion, *Water level fluctuations, Water conveyance, storage, Pressure equipment. Identifiers: Pressurized water.

An apparatus for utilizing the force of waves uses the tremendous inertia of falling water together with the constant rhythmic undulation effect of the surf to collect and pressurize water for subsequent release as a source of power. The collecting apparatus consists of a flexible pipe which includes funnels and check valves along its length. The funnels are held by flotation collars so that the faces of the funnel orifices are awash even in calm sea. The seaward end of the pipe is secured but with enough slack to provide movement with the undulation effect of the surf. The discharge end of the pipe empties into a reservoir where the water is pressurized and stored until it is used to drive a turbine, or the like. (Sinha-OEIS) W75-12062

THE EFFECT OF LEGISLATION OF THE FU-TURE USE OF WATER IN THE LEATHER IN-DUSTRY.

Water Pollution Research Lab., Stevenage (England). For primary bibliographic entry see Field 5D.

BIO-OXIDATION PROCESS SAVES H20. Sun Oil Co., Toledo, Ohio. For primary bibliographic entry see Field 5D.

STRONG IMPACT OF TEXTILES BY U.S. WATER CONTROL ACT,

For primary bibliographic entry see Field 5G. W75-12117

EFFLUENT TREATMENT FOR A SMALL TAN-NERY, Research

Advisory Service, Inc., Western Springs, Ill. For primary bibliographic entry see Field 5D. W75-12118

NO-EFFLUENT TANNERY PROCESSES. Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst. For primary bibliographic entry see Field 5D. W75-12124

COMPLETE INDUSTRIAL WASTE-WATER REUSE GOAL OF REFINING STUDY, Bechtel Corp., San Francisco, Calif. Ecology and Water Quality Group. For primary bibliographic entry see Field 5D. W75-12125

FISHERIES ECONOMICS. A BIBLIOGRAPHY, Manchester Univ. (England). Dept. of Agricultural Economics.

J. A. Butlin, and J. M. Tomkins.

Southampton University, Department of Economics, Environmental Economics Study Group Bibliography Series 3, July 1973. 7 p, 53 ref.

Descriptors: *Bibliographies, *Marine fisheries, *Commercial fishing, *Optimization, Model studies, Law of the Sea, Exploitation, Fish populations, Fish management, Salmon, Pacific Ocean, Regulation, Permits, International waters, Taxes, Welfare(Economics).

Identifiers: *Fishery economics, Common property resource, Halibut fisheries.

This bibliography contains 23 books and 30 articles published in the period from 1942 to 1972. The diverse topics in the broad area of fisheries economics include legal aspects of ocean fishing, management consideration, recent developments and research, specific considerations of Pacific salmon and halibut, the utilization of optimization techniques, and modeling commercial fishing. This bibliography contains 2 articles and 4 books by J.A. Crutchfield, and 4 articles by V.L. Smith. (Becker-Wisconsin) W75-12181

ECONOMIC GROWTH VS. THE ENVIRON-MENT, A BIBLIOGRAPHY, Bristol Univ. (England). Dept. of Economics.

For primary bibliographic entry see Field 6G. W75-12182

ELECTRIC GENERATOR RESPONSIVE TO WAVES IN BODIES OF WATER,

E. L. Schera, Jr. U.S. Patent No 3,898,471, 3 p, 9 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 937, No 1, p 292, August 5, 1975.

Descriptors: *Patents, *Waves(Water), *Ocean waves, *Energy conversion, *Energy transfer, Electric generators, Electric power generation, Identifiers: Surface waves, Oscillation.

A generator is described which is responsive to surface waves, particularly in large bodies of water. The apparatus solves the problem of water. The apparatus solves the problem of producing electric energy for various purposes, particularly flashing signals as an aid to navigation. In operation, this device is adapted to respond to normal surface waves on a base of water and is not intended to function with the action of ocean tides or other surface levels of bodies of water. The adjustment of the float with respect to the level of the water where waves normally occur is made by slots and screws. When the float responds to surface waves, the generator will be operated in op-posite direction, which if a permanent magnet alternator is used, will generate a voltage when the float is moved upward and downward. The voltage is regulated by a solid state regulator. From there the electric current is carried to the lamp for safety illumination. Even small oscillation will generate enough electric power to illuminate the lamp to be visible within a reasonable range. (Sinha-OEIS)

SOLAR SEA THERMAL ENERGY.

Hearing-Subcomm. on Energy-Comm. on Science and Astronautics, U. S. House of Representatives, 93d Cong, 2d Sess, May 23, 1974. 134 p, multiple fig. photo, ref.

Descriptors: *Hydroelectric power, *Oceans, *Heated water, *Electric power production, *Thermal power, Thermal water, Water temperature, Hydrothermal studies, Solar radiation, Enerture, Hydrothermal studies, Solar radiation, Energy, Electric power, Electric generators, Electric powerplants, Electricity, Hydroelectric plants, Electric power costs, Costs, Economics, Tropical regions, Research and development.

Identifiers: *Congressional hearings, *Solar sea powerplants, Energy crisis, Solar energy.

The topic of this subcommittee hearing was the potentiality of extracting solar energy from the ocean waters. Witnesses reported that it is possible to harness ocean solar energy and to produce electric power at a cost competitive with fossil fuel plants. The process of extracting electric power from the ocean involves the use of a standard type heat engine which receives heat from the warm upper layers of the tropical ocean, and then, after extracting power, rejects the residual heat into the deep cold water. Suggestion was made that solar sea power plants offer the opportunity of obtaining an inexhaustible source of low-cost electric power, free of thermal and atmospheric pollution, and without the un-adved problem of redioactions. and without the unsolved problem of radioactive waste disposal. Witnesses presented details regarding construction, cost, and over-all feasibility of solar sea powerplants. (Fernandez-Florida) W75-12196

DEEPWATER PORT ACT OF 1974. For primary bibliographic entry see Field 5G. W75-12198

THE POTENTIAL FOR ENERGY PRODUC-TION FROM GEOTHERMAL RESOURCES. For primary bibliographic entry see Field 4B. W75-12199

THE RUSH FOR OFFSHORE OIL AND GAS: WHERE THINGS STAND ON THE OUTER CONTINENTAL SHELF.

For primary bibliographic entry see Field 5G. W75-12222

HISTORICAL GUIDE TO FEDERAL WATER POLLUTION CONTROL LAWS AFFECTING FOOD PROCESSING,

Economic Research Service, Washington, D.C. For primary bibliographic entry see Field 5G. W75-12226

THE DEEPWATER PORTS ACT OF 1974: HALF SPEED AHEAD,

For primary bibliographic entry see Field 5G. W75-12229

THE ECONOMICS OF CLEAN WATER. Environmental Protection Agency, Washington,

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Agriculture—Group 3F

For primary bibliographic entry see Field 5G. W75-12233

3F. Conservation In Agriculture

PHENOLIC COMPOUNDS OF WHEAT LEAVES UNDER DROUGHT STRESS,

Oklahoma State Univ., Stillwater. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 2I.

W75-11905

INFLUENCE OF SOIL WATER MATRIC POTENTIAL AND RESISTANCE TO PENETRA-TION ON CORN ROOT ELONGATION, H. F. Mirreh, and J. W. Ketcheson. Can J Soil Sci, Vol 53, No 4, p 383-388, 1973.

Descriptors: *Corn(Field), *Soil water, *Root development, Clays, Loams, Soil density, Crop production. Identifiers: Soil water matric, Turgor.

A study of the Interacting effects of soil bulk density and soil water matric potential on resistance to penetration and on corn (Zea mays) root clongation showed that for any level of resistance, elongation was further restricted as potential decreased (suction increased). This was explained through the effect of matric potential on plant turgor, which in turn affects the ability of the root to overcome resistance. At neglibible resistance, elongation was greater in a clay loam soil than over a range equivalent osmotic potentials in solution, indicating that moisture transport in the soil apparently did not restrict moisture supply to the root. The presently accepted upper limits of resistance for corn growth may be too high.--Copyright 1974, Biological Abstracts, Inc. W75-12055

SUPPLEMENTAL WATER USE IN THE EVER-

GLADES AGRICULTURAL AREA, Central and Southern Florida Flood Control Dis-trict, West Palm Beach. Resources Planning Dept.

R. Mierau. Technical Publication 74-4, June 1974. 46 p. 7 fig. 7 tab, 6 ref, 1 append.

Descriptors: *Irrigation, *Water utilization, *Irrigation practices, *Florida, Rainfall, Evaporation, Evapotranspiration, Supplemental irrigation, Irrigation permits, Runoff, Water policy, Discharge(Water), Agriculture.

Identifiers: *Lake Okeechobee, Everglades. Water policy,

Supplementati water use in a portion of the Ever-glades Agricultural Area for the period 1961 through 1971 was examined. Only supplemental water use for the normal irrigation season, November through May, was considered. Supplemental water was taken to be that water released from Lake Okeechobee into the study area. The released water was equated with applied irrigation water to meet crop growth requirements, although other uses for water released from the lake were acknowledged and discussed. A comparison was made between monthly and seasonal water releases into the study area and theoretical crop supplemental water demand on a gross area-wide basis. Also examined, for the same period, were the annual volume of surplus water discharged from the study area to Lake Okeechobee. These were compared with the annual volumes of water released from the lake to meet supplemental water requirements. The investigation found that on a gross area-wide basis: (1) there is no significant goos area-wice oasis: (1) incre is no significant over-application of supplemental water with respect to beneficial use as represented by theoretical crop requirements; (2) there is no ap-parent waste of water from the Lake Okeechobee study area system which, in effect, functions as a 'closed system'; and (3) there has been no abuse of the Central and Southern Florida Flood Control

District's criteria established for the present water use permitting system. (Sims-ISWS)

DESIGN AND OPERATING CRITERIA FOR RURAL WATER SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of

Agricultural Engineering. For primary bibliographic entry see Field 6D.

TRICKLE IRRIGATION SYSTEM,

J. Rangel-Garza, and J. Leal-Diaz. U.S. Patent No 3,897,009, 4 p, 14 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 936, No 5, p 1735, July 29, 1975.

*Patents, Descriptors: *Irrigation Surface irrigation, Irrigation practices, Irrigation operation and maintenance, Irrigation efficiency, Fertilizers, Fungicides, Insecticides. Identifiers: *Trickle irrigation systems

The irrigation system consists of hoses and flexible or rigid pipes to which at different intervals, depending on the needs, will be connected tricklers or when necessary secondary lines will be connected to main lines by a reduction T connector. In the branch pipes are tricklers having two part female and male interfitting members. Grooves on the male member engage the inner female surface to provide water flow channels on the inner circumference of the central pipe bore to reuce pressure. These tricklers are coupled in line in a pipe or hose and have structure for locking the parts together and preventing entry of dirt. (Sinha-OFIS

DRAFT PROPOSAL FOR LEGISLATION TO CONTROL WATER POLLUTION FROM AGRICULTURAL SOURCES,

For primary bibliographic entry see Field 5G. W75-12213

IRRIGATION APPARATUS,

. Grobbelaar.

US Patent No 3,899,132, 5 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 542, August 12, 1975

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Sprinkler irrigation, Irrigation practices, Irrigation operation and maintenance, Water distribution(Applied).

An irrigation apparatus is comprised of a elongated flexible irrigation conduit having sprinkler devices at spaced intervals along its length. Each sprinkler device is comprised of a sprinkler pipe having a nozzle at its free end and has a lateral and longitudinal support arrangement associated with each sprinkler device to support the conduit in its operative position. A storage reel adapted to have the conduit rolled up on it with the sprinkler devices extending radially inward has locating means for locating the sprinkler devices within the reel (Sinha-OEIS)

EMITTER FOR IRRIGATION SYSTEMS,

Harmony Emitter Co., Inc., Tucson, Ariz. R. C. Harmony

US Patent No 3,899,136, 4 p, 4 fig. 5 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 542, August 12, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation efficiency, Surface irrigation, Irrigation operation and maintenance, Water distribution(Applied), Water pressure, Equipment. Identifiers: Emitters. An emitter is described which delivers a constant flow of water despite variations in water pressure and is non-clogging, self regulating and self flush-ing. The emitter having a water discharge outlet and connected to a source of water under pressure for irrigating soil comprises; a pair of imperforate flexible sheets coterminous with one another and defining both the water discharge passageway for a flow of water through the emitter and the water discharge outlet; tranverse ribs within the central part of adjacent surfaces of each of the flexible sheets for establishing a water pressure gradient through the passageway: and pressure means for biasing the pair of sheets toward one another to regulate the lateral expansion of the passageway. The pressure means is responsive and variable in proportion to the water pressure at the source. Therefore the flow of water through the emitter is regulated at a constant rate. (Sinha-OEIS) W75-12303

IRRIGATION SYSTEM.

J. R. Gross

US Patent No 3,901,447, 4 p, 7 fig. 4 ref; Official Gazette of the United States Patent Office, Vol 937, No 4, p 1310, August 26, 1975.

Descriptors: *Patents, *Irrigation systems, *Mist irrigation, *Sprays, *Temperature control, Frost protection, Heat exchangers, Distribution systems, Citrus fruits.

An irrigation system is described which includes a pressurized source of water, a number of distribupressurized source of water, a number of distribu-tion conduits connected with the source of water and equipped with uniformly spaced spray heads for emitting temperature-controlling bodies of mist. Such a system can be employed in reducing temperatures but more frequently can elevate the temperature in order to avoid frost damage. The invention comprises a continuous-flow heat exchanger including a fire-box of tubular configuration. A water jacket surrounds the fire box in which the stream of water is conducted concentrically around the external surface of the fire box. A pressure burner is adapted to project a pressurized stream of heated gases axially through the tubular fire box in a direction opposite to the direction in which the stream of water is conducted. (Sinha-W75-12309

IRRIGATION SYSTEM EMITTERS WITH RENEWABLE FILTERS, B. P. Babin.

US Patent No 3,901,448. 5 p. 29 fig. 11 ref; Official Gazette of the United States Patent Office, Vol. 937, No. 4, p. 1310-1311, August 26, 1975.

*Patents. *Irrigation Descriptors: systems. *Irrigation practices, *Filters, Flow control. Identifiers: *Drip irrigation. Emitters, Soil Identifiers: moistening.

The invention relates to irrigation assemblies for use in long run irrigation systems. The emitters are particularly adapted for use in such systems in that a positive slow discharge of water is assured under varying water pressure conditions. The incorpora-tion in the emitters of filters or filtering elements which, in addition to assisting to the regulation of the discharge flow, perform a significant function in climinating ingress of aperture clogging soil particles while at the same time trapping such con-taminants as might be contained in the irrigating fluid itself. The method of mounting or securing the filters is specifically devised so as to enable periodic filter replacements. The emitter assem blies include or are associated with a discharge opening in the fluid carrying tube with the assembly including an aperture overlying filter or filter element and a retainer devised in a manner so as to secure the filter in position and allow for a discharge of fluid at a slow or drip rate. The retainer will normally incorporate a substantially rigid filter overlying cover defining a chamber for

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

the reception of the filter and includes fluid discharge passages. The cover in turn is affixed to the tube by appropriate securing means engaged between the cover and the tube. (Sinha-OEIS)

PHOSPHORUS METABOLISM AND RESPRIRATION IN WHEAT LEAVES AND ROOTS IN THE CASE OF WATER DEFIENCY. (IN RUSSIAN),

Vsesoyuznyi Institut Rastenievodstva. Leningrad

T. A. Rychkova S-Kh Biol, Vol 8, No 2, p 247-249, 1973.

*Phosphorus. Descriptors: *Metabolism, *Respiration, *Wheat, Leaves, Roots, Energy, Acids, Lipids Identifiers: Nucleic-acid Nucleotides

A study of the effect of slight dehydration on P metabolism and respiration of wheat leaves and roots showed that, in the case of a soil water deficiency during the critical period between the start of shooting and start of heading, nucleic acid metabolism was intensified in the leaves of the upper layer and the content of free nucleotides and lipid P increased. A higher level of respiration cor-responded to increased P metabolism, on the basis of which it is possible to determine an intensification of energy metabolism in plants in the presence of a slight water deficit.--Copyright 1974, Biological Abstracts, Inc. W75-12362

4. WATER QUANTITY MANAGEMENT AND CONTROL

FLOOD PLAIN INFORMATION: SPRING AND WILLOW CREEKS, METROPOLITAN AREA, TEXAS. HOUSTON

Army Engineer District, Galveston, Tex Prepared for Harris Soil and Water Conservation District, Houston, Texas, June, 1972. 38 p, 8 fig, 26 plates, 6 tab.

Descriptors: *Flood control, *Flood data, River basin development, *Flood plain zoning, Floods, *Regional flood, *Flood profiles, Flood discharge, Flood frequency, Flood plains, Flooding, Flood

proofing, *Texas. Identifiers: Intermediate Regional Flood, Standard Project Flood, Spring Creek(Tex), Willow Creek(Tex), *Houston(Tex).

Spring Creek flows 68 miles from west to east along the northern border of Harris County, Texas, 30 minutes commuting time north of downtown Houston. Spring Creek and its major tributary, Willow Creek, drain an area of 760 square miles of increasingly urbanized land. Numerous incorporated and unincorporated communities have developed along their flood plains with extensive residential, commercial, and industrial development. Stream gage records show that the area is subject to frequent summer floods which last several days due to the flat slopes and small channel capacities of the creeks. Thirty-four bridges cross the creeks in the reaches studied. Flood water backs up behind them if trees and other debris collect there and may push a sudden wall of debris and water loose to rush downstream. Millions of dollars of damage were caused by the record May 1929 flood with its discharge of 48,300 cfs. The Intermediate Regional Flood and Standard Project Flood expected in these creeks would be much more severe with discharges of 101,000 cfs and 143,900 cfs respectively. Definitive data is provided for the best planning of the endangered area, although land subsidence due to oil and water withdrawal may somewhat alter the exact flood area boundaries. The situation could be changed by channel improvements, removal of obstructions, or non-structural alternatives including zoning and subdivision regulations. (Herr-North Carolina)

4A. Control Of Water On The Surface

PLANNING MODELS FOR WATER SYSTEM DEVELOPMENT IN MISSISSIPPI COMMUNI-

Mississippi Univ., University. Dept. of Economics and Finance.
For primary bibliographic entry see Field 6D.

DRAINING TELFORD NEW TOWN. Surveyor, Vol. 141, No. 4218, p 49, April 13, 1973.

Descriptors: *Drainage area, *Sewers, *Sewerage, Land reclamation, Tunnels, Siphons, Reservoirs, Construction, Waste water treatment. Identifiers: England, River Severn, River Tern.

The original area of approximately 9000 acres for Telford New Town drains to the River Severn in England with the new drainage area of about 10,000 acres flowing to the River Tern, a tributary of the Severn. At the time the designated area was expanded, long lengths of the sewers in the southern area had been constructed with no allowance being made for future development surrounding sections of the catchment area. The effect of extending the boundary of the new town was to introduce new areas for development within the southern catchment region. It was found possible to alter the proposed sewer network and to introduce an extra balancing reservoir in such a way that flows in the sewers already constructed would not exceed the designed capacity. Two contracts were let for this work: the first, for sewers and land reclamation work; and the second, for sewers in tunnel and open cut and the construction of a siphon draw-off from the balancing reservoir. The Randlay/Hollinswood sewers, used in the projects, will provide drainage for additional areas and will provide the link to divert flows through the extra balancing reservoir. (Sandoski-FIRL) W75-11917

SEATTLE PROJECT CALLS FOR ROCK WEIRS.

Western City, Vol. 49, No. 4, p16, 19, April, 1973. I fig.

Descriptors: *Flood control, *Environmental effects, *weirs, Streams, Geology, Biology, Environmental engineering.
Identifiers: *Environmental Impact Statements,

An environmental impact statement has been prepared by a project planning and engineering consultant to the Seattle Department of Engineering. Now under construction, the project to collect flood water from 210-acres in the North Green-wood section of the city and channel it into Piper Creek at Carkeek City Park, which flows into Puget Sound, will cost approximately two million dollars. The study took much less staff time than was initially felt necessary and was completed under the direction of 2 landscape architect assisted by several hydraulics engineers. Also conassisted by serial fivil and an environmental geologist, who aided by conducting an environmental inventory and analysis encompassing geological history of the creek area, superficial and bedrock geology, groundwater, stream economics, water chemistry, aquatic biology, and terrestrial biology. (Sandoski-FIRL)

TRAINING OF SUTLEJ RIVER BELOW RUPAR HEADWORKS FOR THE PROTECTION OF Hydraulic Research Station, Malakpur(India).
For primary bibliographic entry see Field 4D. W75-11925

A PARTICULAR COMPARISON OF ANNUAL MAXIMA AND PARTIAL DURATION SERIES METHODS OF FLOOD FREQUENCY PREDIC-

Institute of Hydrology, Wallingford (England). For primary bibliographic entry see Field 2E. W75-11929

EXPERIMENTS WITH UNCONVENTIONAL STORM OVERFLOWS, Loughborough Univ. of Technology (England). For primary bibliographic entry see Field 5D. W75-11940

FLOOD EVENT DATA COLLATION, Institute of Hydrology, Wallingford (England). For primary bibliographic entry see Field 7C. W75-11943

FLOODS PROTECTION (SCHUTZ UEBERSCHWEMMUNGEN). Wasser, Luft und Betrieb, Vol 17, No 5, p 165, 1973. 1 fig.

Descriptors: *Flood protection, *Hoses, Repairing, Flood control, Check structures, Barriers, Identifiers: Polyvinyl chloride.

A novel flood protection system has been developed and patented by the Degussa Company in West Germany, consisting of one-meter diameter hoses to be carried to the site of protection, unrolled, and filled as required. The hoses are made of a tear-resistant fabric of endless 'Trevira' fiber coated with polyvinyl chloride, have rot-proof surfaces, and when placed on eneven ground provide a quickly arranged and absolutely watertight barrier against flood waters rising to 60 centimeters. One 30-meter hose rolled up weighs about 100 kilograms and replaces 1100 sandbags. Emptied after use, the hoses can be reused. Damaged sections are repaired by welding or glueing; the hoses are resistant against chemicals, and therefore can be used as emergency containers for dangerous liquids. (Sandoski-FIRL)
W75-11946

A MOBILE SPRINKLER IRRIGATION FACILI-TY FOR MEASUREMENT OF SURFACE RUNOFF AND SOIL EROSION (EINE TRANS-PORTABLE BEREGNUNGSANLAGE FUER DIE MESSUNG VON OBERFLAECHENABFLUSS UND BODENABTRAG), For primary bibliographic entry see Field 7B. W75-11948

FLOOD PROFILES IN THE UMPQUA RIVER BASIN, OREGON: PART 3, UMPQUA RIVER BELOW SCOTTBURG, SCHOLFIELD, COW CREEK ABOVE GLENDALE, Geological Survey, Portland, Oreg.

E. A. Oster. Open-File report, 1975. 108 p, 88 fig, 7 tab, 6 ref.

Descriptors: *Flood profiles, *Flood frequency, *Hydrologic data, *Streamflow, *Oregon, Flood data, Flow rates, Peak discharge, Hydrographs, Analytical techniques, Tidal streams.

Identifiers: *Umpqua River basin(Oreg).

This the third and final report in a series to cover approximately 300 miles of Umpqua River basin streams in Oregon. The study was made at the request of Douglas County Planning Commission to compute profiles for the 10-, 25-, 100-, and 500-

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Control Of Water On The Surface—Group 4A

year floods and the December 1964 flood. The reaches covered in this report are: Umpqua River from Gardiner upstream to Scottsburg, Smith River from the mouth to Sulphur Springs, Schol-field Creek from the mouth to Wind Creek, and upper Cow Creek from below Glendale upstream to Snow Creek, near Anchor. The flood-frequency data needed to determine project discharges were computed by the log-Pearson Type III method, using annual peak-flow data for Cow Creek and the Umpqua River. A regional analysis by the Crops of Engineers (1969) was used for the Smith River and Scholfield Creek. The frequency curves used are shown. The highest annual flows of the Umpqua River usually occur from November through March as a result of heavy winter rains augmented by snowmelt; some annual floods have occurred as late as mid-April, primarily caused by snowmelt from the high mountains of the Cascade Range. Flood discharges on the Smith River and Scholfield Creek reflect the direct influence of coastal storm patterns, which may not penetrate far enough inland to cause Umpqua River flood. In the lower estuary area, extreme high tides and strong onshore wind increase flood levels above those caused by high river discharges along. (Woodard-USGS) W75-11959

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 8. WESTERN GULF OF MEXICO BASIN.

Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-11966

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SIATES, 1960-VE FART 2. SOUTH ATLANTIC
BASINS - VOLUME 3, BASINS FROM
APALACHICOLA RIVER TO PEARL RIVER.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-11967

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 6. MISSOURI RIVER BASIN-VOLUME 1. MISSOURI RIVER BASIN ABOVE WILLISTON, NORTH DAKOTA. Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-11968

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIP-PI RIVER--VOLUME 2. ARKANSAS RIVER BASIN.

Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-11969

EFFECT OF 2,4-D AND VARIOUS SALTS ON EURASIAN WATERMILFOIL.
Tennessee Valley Authority, Muscle Shoals, Ala. Environmental Biology Branch.
Weed Science, Vol 22, No 6, p 591-594, 1974. 3 tab, 11 ref.

Descriptors: "Herbicides, "2,4-D, "Aquatic weed control, "Salts, Laboratory tests, Water level fluctuations, Copper sulfate, Sodium chloride, Sodium arsenite, Estuaries, Salinity, Tennessee, Compatibility, Chemcontrol, Toxicity. Identifiers: "Eurasian watermilfoil, Aluminum chloride, Ammonium chloride, Barium chloride, Sodium tetraborate, Sodium arsenite, Mercuric chloride, Lead nitrate, Zinc sulfate, Synergistic effects, Antagonistic effects.

fects, Antagonistic effects.

watermilfoil Eurasian of nagement (Myriophyllum spicatum) in the Tennessee Valley watershed involves water level fluctuation and herbicidal treatment with 2,4-D. Possible addition

of chemicals to make 2,4-D treatment more effective and economical was tested by measuring growth of watermilfoil under laboratory conditions with sublethal levels of 2,4-D and partially inhibitory concentrations of aluminum chloride, ammonium chloride, sodium arsenite, chloride, sodium tetraborate, copper sulfate, mercuric chloride, lead nitrate, sodium chloride, and zinc sulfate. Barium chloride, lead nitrate, and zinc sulfate were additive in effect with 2,4-D. Other compounds produced synergism at some concentrations and mutual antagonism at others. Effectiveness of 2,4-D was increased more by mercuric chloride, aluminum chloride, sodium chloride, and sodium arsenite than by copper sulfate. The greatest synergism was observed with mercuric chloride (0.2 micromoles), aluminum chloride (10.0 micromoles), and sodium chloride (200 millimoles). Maximum synergism for sodium arsenite with 2,4-D was at a level sightly above the criterion for potable water. Lower arsenic con-centrations and higher 2,4-D concentrations should be explored. The sodium chloride concentration necessary for effective interaction with 2,4-D is too high to be useful but indicates erratic results obtained in estuaries subject to salinity fluctuations may be due to the sodium chloride concentration. (Buchanan-Davidson--Wisconsin) W75-11990

THE RISK OF DEOXYGENATION OF WATER IN HERBICIDE APPLICATION FOR AQUATIC

WEED CONTROL, University of Wales Inst. of Science and Tech., Cardiff. For primary bibliographic entry see Field 5A. W75-11996

EVALUATING THE PRODUCTIVITY OF PINE FORESTS IN THE HINTON-EDSON AREA, AL-BERTA, FROM SOIL SURVEY MAPS

Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
J. Dumanski, J. C. Wright, and J. D. Lindsay. Can J Soil Sci, Vol 53, No 4, p 405-419, 1973.

Descriptors: *Production, *Canada, Forests, *Pine trees, *Lodgepole pine trees, Climates, Land use, Land management, *Soil surveys, Soil types, *Forest management, *Land classification, Drainage, Slopes, Mapping. Identifiers: *Alberta.

Effective land use and land management policies are based ideally on data collected from land clas-sification and land evaluation procedures. This paper describes a method employed in classifying and evaluating land for the production of lodgepole pine (Pinus contorta var. latifolia) in the Hinton-Edson area of Alberta (Canada). Initially, a soil survey was conducted in the area. Productivity of various collections of soils was then obtained by statistically comparing soil information derived from the soils map with forest growth in-formation obtained from the continuous forest in-ventory program of North Western Pulp and Power Limited of Hinton. Results indicate that aspect has minimal effect on pine productivity exaspect has minimal effect on pine productivity ex-cept for sandy and gravelly soils. General dif-ferences in growth were related to soil parent material, climate, drainage, and physiography, and material, climate, dramage, and physiography, and more specific differences were attributed to soil subgroup, soil series, soil reaction, and percent slope. It was relized that pine growth is a function of pedological, landform, and climatological factors, and all must be considered when evaluating productivity.—Copyright 1974, Biological Abstracts Inc. stracts, Inc. W75-12003

STOCHASTIC HYDROLOGIC SYSTEMS, Illinois Univ., Urbana, Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 2A.
W75-12015

NONLINEAR RUNOFF KERNELS OF HYDROLOGIC SYSTEM,

Tokyo Inst. of Tech. (Japan). Dept. of Civil En-For primary bibliographic entry see Field 2A. W75-12019 gineering.

THE STOCHASTIC KINEMATIC WAVE. Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12023

SYSTEMS SIMULATION OF STREAMFLOWS, Kyoto Univ., (Japan), Dept. of Civil Engineering. For primary bibliographic entry see Field 2E. W75-12024

AN APPLICATION OF SIMULATED RAINFALL MODELS TO FORECASTING OF THE LONG TERM VARIATION OF RIVER BED, Osaka Univ. (Japan). Dept. of Civil Engineering. For primary bibliographic entry see Field 2J. W75-12028

A BAYESIAN FRAMEWORK FOR THE USE OF REGIONAL INFORMATION IN HYDROLOGY. Resource Analysis, Inc., Cambridge, Mas For primary bibliographic entry see Field 6A. W75-12048

1974 WATER RESOURCES DATA FOR OREGON, SURFACE WATER RECORDS, PRECIPITATION RECORDS,

Oregon State Engineers Office, Salem. Water Resources Dept. For primary bibliographic entry see Field 7C. W75-12087

DESIGN AND OPERATING CRITERIA FOR DESIGN AND OPERATING CRITERIA FOR RURAL WATER SYSTEMS, Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 6D. W75-12126

AQUATIC PLANTS REMOVE CHEMICALS FROM POLLUTED WATERS. For primary bibliographic entry see Field 5G. W75-12145

STORM TIDE FREQUENCIES ON THE SOUTH

CAROLINA COAST, National Weather Service, Silver Spring, Md. For primary bibliographic entry see Field 2L. W75-12160

A STATISTICAL STUDY OF TROPICAL CYCLONE POSITIONING ERRORS WITH ECONOMIC APPLICATIONS, National Hurricane Center, Coral Gables, Fla. For primary bibliographic entry see Field 2B. W75-12166

A STUDY OF FLASH-FLOOD SUSCEPTIBILITY -- A BASIN IN SOUTHERN ARIZONA, National Weather Service, Salt Lake City, Utah. Western Region. G. Williams. Memorandum NWS WR-99, August 1975. 9 p, 2

fig, 1 tab, 15 ref.

Descriptors: *Floods, *Flash floods, Hydrology, Flood control, Precipitation(Atmospheric), Rainfall, Disasters, Weather, River basins, Forecasting, Water, Topography, Flood damage, *Arizona. Identifiers: *Flood forecasting, *Flash flooding, *Flash flood susceptibility, *Flood studies, Basin

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL Group 4A-Control Of Water On The Surface

flooding. Hydrologic analysis, Frequency analysis, *Sabino Canyon(Ariz), Hydrologic events.

Two commonly used methods of hydrologic analyses are parametric reconstruction and development of frequency distributions. Both techniques can be used to develop estimates of potential of damaging flash floods. However, under conditions of limited data, many areas may not have experienced enough flash floods to be not nave experience enough hash flooding. This paper gives a method to infer expected severity for flooding based on frequency analysis, which does not require a complete spectrum of data over a given basin. This method was used to estimate potential peak flows on Sabino Canyon, Arizona, and probability of occurrence of specified magnitudes was analyzed. These estimates indicate a strong possibility of damaging flash floods occur-ring in areas where none have occurred in several decades. (N W75-12167 ades. (NOAA)

REPORT TO THE CONGRESS ON OCEAN DUMPING RESEARCH, JANUARY THROUGH DECEMBER 1974 PUBLIC LAW 92-532, TITLE II. SECTION 201.

National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-12173

A STUDY OF FLASH-FLOOD OCCURRENCES AT A SITE VERSUS OVER A FORECAST ZONE,

National Weather Service, Salt Lake City, Utah. Western Region. For primary bibliographic entry see Field 2E. W75-12174

DIVERSION AND WITHDRAWAL OF ADDITIONAL WATER FROM LAKE MICHIGAN INTO THE ILLINOIS WATERWAY.

Hearings-Subcomm. on Water Resources, Comm. on Public Works, U. S. House of Representatives, 93d Cong, 2d Sess, October 8-9, 1974. 77 p, 2 tab.

Descriptors: *Water control, *Water law, *Legislation, *Water level fluctuations, *Water Levels, Lakes, *Legislation, *Water level fluctuations, *Water management (Applied), Water levels, Lakes, Water, Flood control, Flood routing, Flow control, Routing, Water distribution (Applied), Flow, Legal aspects, Water transfer, Administrative agencies, Federal Government, Water policy, Non-structural alternatives, Aesthetics, Public health, Great Lakes, Lake Michigan.

Identifiers: *Congressional hearings, Environmental policy, Navigation obstructions.

Hearings were held before the House Subcommit-Public Works to consider legislation that would permit the diversion and withdrawal of additional water from Lake Michigan into the Illinois Waterway, and for various other purposes. Testimony the public water from Lake Michigan into the Illinois Waterway, and for various other purposes. Testimony the numerous federal, states, and local was given by numerous federal, states, and local officials. The purpose of the water diversion is to alleviate the tremendous human and economic hardships caused by current high waters throughout the Great Lakes. Concern was expressed over preservation of the Lake Michigan shoreline as well as prevention of flood damage. It shoreline as well as prevention of flood damage. It was felt that the proposed measures would be desirable from esthetic and public health viewpoints. The possibility of such disadvantages as downstream flooding and adverse effects on navigation were mentioned. The general consensus, however, was that the disadvantages could be overcome through careful control of the diversion. (Fernandez-Florida)

THE FEDERAL COMMON LAW OF ACCRETION: A NEW ELEMENT IN PROPERTY LAW, For primary bibliographic entry see Field 6E.

MI

W75-12205

THE ALLOCATION OF WATERS OF INTER-NATIONAL RIVERS. Washington, D.C. Law Georgetown Univ.,

For primary bibliographic entry see Field 6E. W75-12219 Center.

FLOOD INSURANCE AND FLOOD PLAIN ZON-ING AS COMPATIBLE COMPONENTS, Clark Univ., Worcester, Mass. Dept. of Geography.

For primary bibliographic entry see Field 6F.

THE DEEPWATER PORTS ACT OF 1974; HALF SPEED AHEAD,
For primary bibliographic entry see Field 5G.

LAND USE CONTROLS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT: A CITIZEN'S GUIDE.

National Resources Defense Council, Washington, D. C. For primary bibliographic entry see Field 5G. W75-12237

1974 ANNUAL REPORT, GREAT LAKES BASIN COMMISSION Great Lakes Basin Commission, Ann Arbor,

Mich. For primary bibliographic entry see Field 5G. W75-12238

CORPS' GUIDELINES FOR DAM SAFETY IN-SPECTION NEED REVAMPING, Tennessee Valley Authority, Knoxville. Flood

Control Branch.
For primary bibliographic entry see Field 8A.
W75-12241

PROPERTY (WETLANDS REGULATION), For primary bibliographic entry see Field 6E. W75-12247

RIVER CROSSING PERMITS FOR BUCKEYE RIVER CROSSING PERMITS FOR BUCKEYE
PIPE LINE CO. PROPOSED PETROLEUM
PRODUCTS PIPELINE SYSTEM BETWEEN
LINDEN, NEW JERSEY AND MACUNGIE,
PENNSYLVANIA (FINAL ENVIRONMENTAL
IMPACT STATEMENT).
Army Engineer Div. North Atlantic, New York.

For primary bibliographic entry see Field 8A. W75-12258

WATER BANK PROGRAM.

Soil Conservation Service, Washington, D. C. For primary bibliographic entry see Field 6E. W75-12259

ARE CHEMICALS USED ALGAE CONTROL BIODEGRADABLE

Wisconsin Univ., Madison. For primary bibliographic entry see Field 5C. W75-12325

FLOW QUANTITIES IN RESIDENTIAL WEEP-ING TILE SYSTEMS--A CALCULATIONAL

METHOD, Ontario Ministry of the Environment, Toronto. Pollution Control Branch.

Research Paper No. S2042, February, 1975. 28 p, 8

Descriptors: *Flow measurement, *Tile drains, Urban drainage, Storm water, Storm drains, Storage tanks, Infiltration, Rainfall, Methodology. Identifiers: Weeping tile drainage.

The installation of weeping tiles for residential property drainage has presented several possibili-ties of what to do with the collected water including: connection to sanitary sewer; connection to storm sewer; proper grading with runoff away from the house; storage of excess wet weather flow; overflow treatment; and, diversion of roof leader. The proper choice of disposal method depends on the flow quantities per subdivision. A calculational method is presented for determining these quantities based on Darcy's Law and the continuity equation. Requirements for using the calculational procedure are: knowledge of the physiography and soil conditions of the area; proper perspective in the judgement of the hydrau-lic situation; and, knowledge of the technique used in laying the weeping tile. Parameters involved in the estimation of weeping tile flow quantities are infiltration, the initial process of water seepage through dry or drained soil to reach the water table; weeping tile drainage, the quantity flowing through the drain as a function of the average rainfall intensity; and, time required for drainage after precipitation ceases. A sample calculation of weeping tile flow is presented for a typical house and surrounding property using experimental data obtained from a house in Niagara Falls, Canada. (Orr-FIRL) W75-12328

THE FLOATING COVER: BEST WAY TO COVER A FINISHED-WATER RESERVOIR, For primary bibliographic entry see Field 5F.

FLOOD PLAIN INFORMATION: MOORES CREEK, ALBEMARLE COUNTY AND CHAR-

CREER, ALBEMARLE COUNTY AND CHAR-LOTTESVILLE, VIRGINIA.

Army Engineer District, Norfolk, Va.

Prepared for Charlottesville and Albemarle Coun-ty, Va, Sept, 1971. 53 p, 9 fig, 15 tab, 19 plates.

Descriptors: *Floods, *Flooding, *Flood plains, *Virginia, Flood control, Flood protection, Dams, Flash floods.

Identifiers: *Moores Creek(Va), Charlot-tesville(Va), Albemarle County(Va), Intermediate Regional Flood, Standard Project Flood, Biscuit Run(Va), Rivanna River(Va).

Flowing easterly through Albemarle County, Moores Creek empties into the Rivanna River at Charlottesville. The study area also includes a 3-mile long flood plain of Biscuit Run, a tributary of Moores Creek. The entire watershed covers an area of 34.5 square miles. The flood plain is mostly undeveloped being used for agricultural and rural purposes except for some scattered structures along the left bank. Increased urbanization of the city of Charlottesville may cause extensive development on the flood plain. Main flood season is spring, although larger floods occur any time is spring, although larger floods occur any time resulting from heavy general rains or from intense rainfall produced by tropical storms. Flooding may occur as a result of backwater from Rivanna River. Flood duration is short lasting less than a River. Flood duration is short lasting less than a day. No flood control or related measures exist in the study area. Ten bridges as well as a low dam obstruct the flood flow. Using data from nearby streams and personal interviews, October 16, 1942 was determined as the date of the greatest flood. An Intermediate Regional Flood would have a peak discharge of 20,700 cfs at Virginia Route 20 Bridge with maximum channel velocities of 14 ft/sec, remaining out of banks ten hours on Moores Creek. A Standard Project Flood on Moores Creek would have a peak discharge of 28,250 cfs at Virginia Route 20 Bridge, maximum channel velocities of 15 ft/sec and remain out of banks for 15 hours. (Salzman-North Carolina) W75-12366 FLOOD PLAIN INFORMATION--COASTAL FLOODING: TOWN OF POQUOSON, VIR-GINIA.

Army Engineer District, Norfolk, Va. June, 1971. 41 p, 4 tab, 15 fig.

Descriptors: *Flood forecasting, *Flood frequency, *Floods, *Flood data, *Virginia, Water management(Applied), Flood peak, Flood protection, Flood recurrence interval, Flood water, Flow duration, Flood damage, Flood proofing, Tidal waters, Estuaries, Chesapeake Bay.

Identifiers: *Poquoson(Va), intermediate Regional Flood, Standard Project Flood, Subdivision regulations, Northeasters.

The tidal flood situation of Poquoson, Virginia, at The total flood situation of Poquoson, Virginia, at the eastern tip of York County, situated on the western shore of Chesapeake Bay between the tidal Poquoson and Back Rivers, is presented to help local officials solve flooding problems and wisely use land subject to flooding. Records of tidal flood experience have been developed using tidal records of the nearby areas, interviews and historical documents. Greatest floods occurred in 1933 and 1962, caused by Chesapeake Bay waters driven by a hurricane and a northeast storm, respectively. Standard Project Tidal Flood determination indicates tide heights as high as elevation 13.0 are possible and Intermediate Regional Tidal Flood heights between elevations 8.0 and 9.0 can be expected about once per 100 years. Resulting flood damage would be substantial due to the great extent and depth of flooding, since most of Poquoson is below elevation 7.0 msl datum. Many houses, roads and streets would become inun-dated. Main flood season due to hurricane extends dated. Main Hood season due to nurricane extends from May to November. Water velocity varies widely from a few feet per second for tidal currents up to 25 feet per second (17 miles per hour) for wind-driven waves. Flooding caused by hurricanes is of shorter duration than that caused by northeasterns (cyclones). A year seldom passes without storms severe enough to cause flooding. To minimize flood damage, Poquoson should control flood plain development through zoning and subdivision regulations and construct flood pro-tection works. (Grden-North Carolina) W75-12367

FLOOD PLAIN INFORMATION: MEHERRIN RIVER, EMPORIA, VIRGINIA.

Army Engineer District, Norfolk, Va. Prepared for the Town of Emporia, Virginia, July, 1964. 8 p. 1 fig: technical appendix - 23 p. 5 fig, 7 plates, 6 tab, 25 ref.

Descriptors: *Flooding, Floods, *Flood control, *Flood profiles, *Flood protection, Water management(Applied), *Flood plains, *Virginia. Identifiers: *Meherrin River(Va), Emporia(Va), Intermediate Regional Flood, Standard Project

Draining a long, narrow area of about 749 sq mi, including the city of Emporia, a farm market center, the Meherrin River is subject to flooding caused by storms over the entire area lasting 2 to 3 days. The average rainfall is about 45 inches on the watershed above Emporia. The flood plain includes residential and commercial development. One small reservoir owned by Virginia Electric and Power Company has no significant effect on floods due to the small volume of available floods due to the small volume of available storage. A county regulation forbides subdivision of land subject to flooding for residential use. Several flood reducing proposals including flood proofing, Zoning regulations, building codes, al-ternate uses of flood plain, and control of filling on flood plain are suggested. The greatest flood oc-curred in August 1940 with a peak discharge of 40,000 cfs. Most recent flood was January 9, 1962 with a discharge of 12,000 cfs. A Stuere flood 40,000 cfs. Most recent 1000 was January 9, 1902 with a discharge of 12,900 cfs. A 50-year flood would have an estimated peak discharge of 23,000 cfs, considerably below the 1940 flood, while a Standard Project Flood's estimated peak discharge would be 40,000 cfs, about 2 feet higher

than the 1940 flood. The purpose of this report is to make people aware of the possibility of flooding and to suggest measures to limit flood damage. (Salzman-North Carolina)

FLOOD PLAIN INFORMATION, WILLAMETTE RIVER, JOHNSON, KELLOGG AND MT. SCOTT CREEKS, MILWAUKIE-OAK GROVE-LAKE OSWEGO, OREGON. Army Engineer District, Portland, Oreg. Prepared for Clackamas County, Oregon, May 1970. 55 p, 6 fig, 24 plates, 17 tab

Descriptors: *Floods, *Flooding, *Flood plains, Flood control, Flood protection, Reservoirs, Historic floods, *Oregon, *Flood forecasting. Identifiers: *Willamette River(Ore), Johnson Creek(Ore), Kellogg Creek(Ore), Mt. Scott Creek(Ore), Milwaukie(Ore), Oak Grove(Ore), Lake Oswego(Ore), Intermediate Regional Flood, Standard Project Flood.

Located just south of Portland, Oregon, on the east bank of Willamette River, Milwaukie and Oak Grove are inundated by flood waters of its tributaries, Johnson Creek and Kellogg Creek respective-ly. The town of Lake Oswego fronts on the west bank of the Willamette River. Principal residential, commercial and industrial developments lie on these flood plains. Main flood season is winter or spring, depending upon principal source of runoff and the water surface elevations on Columbia and the water surface tevations of Common River. Heavy rain augmented by snowmelt and in-tense rainfall cause flooding. Floods last from 1 to 5 days on the creeks, 7 to 14 days on the river. No authorized or proposed flood control measures for Kellogg Creek or its major tributary, Mt. Scott Creek, exist. An authorized channel improvement project for Johnson Creek has not been implemented. Eleven upstream multiple purpose reservoirs on Willamette River operate for flood convoirs on wilamette kiver operate for flood con-trol. No flood plain regulations are in effect. Greatest known flood occurred in December 1861 on Willamette River and in December 1964 on Johnson, Kellogg and Mt. Scott Creeks. An Inter-mediate Regional Flood would be 4 ft lower than the December 1964 flood while a Standard Project Flood would be from 2 to 5 ft higher than the December 1964 flood. Flood damage from any major flood would be substantial. This report provides a basis for further study and planning by local governing bodies. (Salzman-North Carolina) W75-12369

FLOOD PLAIN INFORMATION: HASSAYAM-PA RIVER, VICINITY OF ARIZONA. WICKENBURG,

Army Engineer District, Los Angeles, Calif.
Prepared for Flood Control District of Maricopa
County, Arizona, April, 1972. 27 p, 13 fig, 23

Descriptors: *Floods, *Flooding, *Flood profiles, *Historic floods, *Erosion, Flash flood, Flood flow, Flood forecasting, Flood data, Flow duration, Deposition(Sediments), *Arizona.
Identifiers: *Hassayampa River(Ariz), Wickenburg(Ariz), Intermediate Regional Flood(IRF), Standard Project Flood.

Originating in the Bradshaw Mountains south of Prescott, the Hassayampa River drains a study area ranging from approximately 1830 ft to 7700 ft above mean sea level. Northern third of the basin is heavily forested mountains, central third of the basin is heavily forested mountains, central third is rolling hills, southern third is desert valley. Upstream gradient is about 400 f/mi; gradient is 20 f/mi near the downstream study limit. In Wickenburg, a retirement and dude ranch center 50 miles postburst of Phoenic development. northwest of Phoenix, development in the flood plain includes a sewage treatment plant, a high school, apartments, public utilities and a private airstrip. Since little flat land is available elsewhere pressure for expanding flood plain development is anticipated. In this arid, sub-tropical climate zone

of infrequent rainfall, flash floods occur in late summer and early fall from general storms and severe thunderstorms. In 1890 one of the worst flood disasters in the U.S. in terms of loss of life happened when a dam under construction failed killing 76 persons. In 1970 intense rainfall from Hurricane Norma created a major flood causing severe damage to property including the sewage disposal system which created a health hazard. No lives were lost. An Intermediate Regional Flood (IRF) would have a peak discharge at Box Canyon (location of a USGS stream gage) of 77,000 cfs as compared to 58,000 cfs for 1970 flood. Channel velocity will range from 6-20 ft/sec with 1-10 ft/sec overbank flow in flood plain areas. During a Standard Project Flood expected peak discharge would be 140,000 cfs with channel velocities 1 to 5 feet greater than an IRF causing severe erosion plus deposits of silt and debris. An irrigation control dam in Box Canyon proposed in 1945 has not been built. (Hufschmidt-North Carolina)

FLOOD PLAIN INFORMATION: FOUNTAIN CREEK, COLORADO SPRINGS, MANITOU SPRINGS, COLORADO.

Army Engineer District, Albuquerque, N. Mex. For primary bibliographic entry see Field 2E.

FLOOD PLAIN INFORMATION: TONAWANDA CREEK AND ITS AFFECTED TRIBUTARIES, ERIE AND NIAGARA COUNTIES, NEW YORK. Army Engineer District, Buffalo, N. Y. For primary bibliographic entry see Field 2E. W75-12373

FLOOD PLAIN INFORMATION: ONION

CREEK, AUSTIN, TEXAS.
Turner, Collie and Braden, Inc., Houston, Tex.;
and Army Engineer District, Galveston, Tex. Prepared for the City of Austin, June, 1973. 38 p, 6 fig. 15 plates, 6 tab.

Descriptors: *Floods, *Flood plains, *Flood conricol, *Flood protection, *Flood plain zoning, Land use, Flood recurrence interval, Flood damage, Flow characteristics, *Texas, Historic floods, Flood forecasting, Nonstructural alternatives, Identifiers: *Austin(Tex), *Onion Creek(Tex), Intermediate Regional Flood(IRF), Standard Project

This examination of past floods and estimation of future floods on 21 miles of Onion Creek near Austin, Texas, was requested as the basis for a flood plain zoning ordinance. Past floods have not done significant damage due to the agricultural use of the land bordering Onion Creek, which slopes about 8 ft/mi with cypress, oak and mesquite in the wooded portions of the flood plain. Pressure has been exerted to encroach on the flood plain with residential developments to accommodate the needs of Austin's anticipated growth of up to 100,000 people by 1983. Part of the City of Austin sewage treatment plant is located in the flood plain and a state park and municipal golf course are proposed. Located within a hydrologic province in the path of tropical and semitropical storms, Onion Creek can experience some of the highest rainfall in the U. S. Because of the creek's narrow valley, flooding does not extend to wide areas but water velocity is high and presents potential damage to structure in the flood path. The major flood of record occurred in September, 1921 with a discharge of 138,000 cfs, almost twice that of sub-sequent floods. An Intermediate Regional Flood would discharge 83,700 cfs and a Standard Project Flood would have a peak discharge of 162,000 cfs. Eleven bridges span the creek and at six of them the bridge floor is lower than the IRF crest elevation which could cause transportation and evacuation problems if not actual damage to bridges. The report recommends use of nonstructural alterna-tives including flood plain zoning, subdivision

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Group 4A-Control Of Water On The Surface

regulations, building codes, health regulations, and development policies to protect against the hazards of floods on Onion Creek. (Park-North W75-12374

PLAIN INFORMATION: FLOOD RIVER, HOWARDSVILLE TO SCOTTSVILLE, ALBEMARLE COUNTY, VIRGINIA. Army Engineer District, Norfolk, Va.

Prepared for the Albemarle County Board of Su-pervisors, November, 1973. 26 p, 17 fig, 13 plates, 5 tab.

Descriptors: *Floods, *Flooding, *Flood forecasting, *Flood profiles, Flood protection, Flood control, Flood plains, Historic floods, *Virginia. Identifiers: *James River(Va), Howardsville(Va), Scottsville(Va), Albemarle County(Va), Totier Creek(Va), Intermediate Regional Flood, Standard Project Flood.

The 11-mile portion of the James River Basin covered in this report is located on the Piedmont Plateau approximately 200 miles above the river's mouth. The river channel slopes at 2.7 feet per mile and is relatively free of vegetation. Varying from 200 to 2500 feet in width, the flood plain is open and in agricultural use. The only development consists of several business and industrial establishments in the town of Scottsville. A stream gaging station at Scottsville shows that floods are produced by intense rainfall during all seasons but most notable are the hurricane produced floods. Flood stages last for several days due to the size of the drainage area (4,584 square miles). Although an advisory flood protection and management study has been made, no flood damage reduction measures presently exist. An earthfill dam on the Totier Creek tributary has no flood control capacity. The greatest flood occurred on June 22, 1972 as a result of intense rainfall associated with Hurricane Agnes. The river crested at 34.02 feet and had a peak discharge of 301,000 cubic feet per second (cfs). The most recent flood on October 6, 1972 crested at 23.24 feet and had a peak discharge of 97,600 cfs. An Intermediate Regional Flood and Standard Project Flood would inundate the flood plain with peak discharges of 237,000 cfs and 445,000 cfs, respectively. Damage exceeding the \$4 million total inflicted by Hurricane Agnes can be expected unless control measures are taken. (Salzman-North Carolina) W75-12375

FLOOD PLAIN INFORMATION: SOUTH SAN-TIAM RIVER, LEBANON, OREGON.

Army Engineer District, Portland, Oreg. Prepared for Linn County, Oregon, June, 1973. 30 p. 14 fig. 19 plates, 5 tab.

Descriptors: Floods, *Flood control, *Flood protection, *Water storage, *Flood forecasting, *Flood profiles, Flooding, Flood plain zoning, Reservoirs, *Oregon.

Identifiers: *South Santiam River(Ore), Lebanon(Ore). Intermediate Regional Flood, Standard Project Flood.

South Santiam River, a tributary of the Willamette River, drains 1,037 square miles in central northwestern Oregon. Slope varies from 8 ft/mi upstream to 3 ft/mi downstream. Most of the flood plain in the 22-mile study area is devoted to agriculture. Lebanon (population 6,372) is on the flood plain where South Santiam River emerges from the foothills. Flood season extends from October through April with larger floods in December and January resulting from intense rainfall aug-mented by snowmelt when the soil is saturated or frozen. The river remains above bankfull stage for 6 to 8 days during floods. Natural and manmade obstructions, including 4 bridges, impede flood flow. Two flood control storage projects regulate runoff for about 75% of the drainage area. Over 20 bank protection projects have been constructed

under emergency flood control authorization and channel debris removed. A comprehensive land-use plan makes provisions for county implemented use plan makes provisions for county implemented flood plain regulations. Largest known flood occurred in December 1861. The December 1964 flood, the largest since stream flow records have been kept, crested 24.5 feet above bankfull and discharged 95,200 cfs. An Intermediate Regional Flood (IRF) would have discharged 98,000 cfs under natural conditions. With upstream storage provided by Foster and Green Peter Projects, an IRF would discharge 46,500 cfs and Standard Pro-ject Flood would discharge 92,000 cfs. (Salzman-North Carolina)

SPECIAL FLOOD HAZARD INFORMATION: ISSAQUAH AND TIBBETTS CREEKS, ISSAQUAH AND VICINITY, WASHINGTON.

Army Engineer District, Seattle Wash.
Prepared for the City of Issaquah and King County, Washington, June, 1971. 8 p, 14 plates.

Descriptors: *Flood plains, *Planning, plain zoning, Flood damage, Land use, Obstructions to flow, Flood profiles, Flood data, Floodways, *Washington, Erosion.

ways, "Washington, Erosion. Identifiers: "Issaquah Creek(Wash), "Tibbetts Creek(Wash), Issaquah(Wash), Flood plain management, Intermediate Regional Flood, Lake Sammamish(Wash), Cascade Range, Issaquah County(Wash), King County(Wash).

Extending upstream from Lake Sammamish, Issaquah Creek, its North and East Forks, and Tibbetts Creek drain 59 square miles of the forested foothills of the Cascade Range in Washington. Creek channels are well defined and overgrown with brush. Major flood season extends from October until March. Greatest flooding is caused by rainstorms although melting snow occasionally augments flooding. Brush and materials placed to stabilize creek banks reduce channel capacity and will increase flood depths on adjacent lands. The maximum flood flow at the gage on the Issaquah Creek near the mouth occurred January 5, 1969 and was 1960 cfs. At the same location, an Inter-mediate Regional Flood (IRF) would have a peak discharge of 4750 cfs and a channel velocity of 15 orscharge of 4/30 cts and a channel velocity of 15 feet per second, fast enough to create erosion problems. Flood occurrences greater than an IRF were not investigated. Most of the flood prone areas are still undeveloped. The greatest development of the flood plain is at the city of Issaquah which is primarily residential. Thirty-seven bridges cross the creeks, creating potential obstructions to flow. The report recommends that the local governments consider land use zoning measures and the establishment of a floodway to minimize flood damages. (Diefendorf-North Carolina) W75-12377

SPECIAL FLOOD HAZARD INFORMATION: PARADISE CREEK, PULLMAN AND VICINITY, WASHINGTON.

Army Engineer District, Walla Walla, Wash.
Prepared for Whitman County, Washington,
January 1970. 10 p, 10 plates, 3 fig, 1 tab.

Descriptors: *Flood plains, *Flood damage, *Planning, *Flood profiles, Land use, Flood data, Obstruction to flow, Flood plain zoning, *Washington, Idaho.

Identifiers: *Paradise Creek(Wash),

*Pullman(Wash), Whitman County(Wash), Flood plain management, Standard Project Flood, Intermediate Regional Flood.

Throughout the 6.8 mile study reach of Paradise Creek east of Pullman, Washington, the flood plain is quite narrow, the average stream slope is 25 ft/mi, channel depth averages 6 feet, and mean basin elevation is 2700 ft above sea level. Major floods occurred in March, 1910, and February, 1948, but details on these floods are lacking. Peak flow of future planning floods was determined from meteorological and climatological records and gage data from nearby streams. At the mouth of Paradise Creek in Pullman the discharge of an Intermediate Regional Flood (IRF) would be 2400 cfs. Peak discharge for the Standard Project Flood (SPF) would be 3700 cfs at the mouth. Floods on Paradise Creek are of short duration, usually less than one day. Velocities in the creek channel range up to 18 feet per second. Velocities up to 6 feet per second can occur in the overbank area; velocities over 3 feet per second are considered hazardous. There are 27 bridges within the study reach, some severely restricting flow. They could sustain considerable damage in an IRF or SPF. Flood plain developments include residential and commercial establishments; however, most of the land is used for grazing. Flood plain regulations by the city of Pullman and Whitman County are needed as increasing development is expected along the Creek. (Diefendorf-North Carolina) W75-12378

FLOOD PLAIN INFORMATION: HACKBERRY CREEK AND COTTONWOOD BRANCH, DAL-LAS COUNTY, TEXAS. Army Engineer District, Fort Worth, Tex.

Prepared for Dallas County, Texas, December, 1974, 33 p. 7 fig. 11 plates, 5 tab.

Descriptors: *Floods, *Flood plains, *Flood profile, *Flood forecasting, *Flooding, *Flood plain zoning, Obstructions to flow, Maximum probable flood, *Texas.

Identifiers: Irving(Tex), *Hackberry Creek(Tex), Cottonwood Branch(Tex), Dallas County(Tex), Intermediate Regional Flood(IRF), Standard Proiect Flood(SPF)

The watershed of Hackberry Creek in northwest Dallas County, Texas, has a drainage area of 20.0 square miles primarily rural in nature but with growing development pressures from Irving, Fastest Growing City in Texas.' (From 1950 to 1970 Irving's population grew from 2,621 to 97,260). The Dallas-Ft. Worth Regional Airport is located in the upper portion of the drainage basin and is certain to spur continued growth. Although no records have been kept on flood characteristics of Hackberry Creek and Cottonwood Branch, a major tributary, future flood predictions were based on flood data for neighboring streams and on precipitation data. The Intermediate Regional Flood (IRF) on Hackberry Creek above the confluence with the South Fork of Hackberry Creek would have a peak discharge of 16,200 cfs, a height of rise above bankfull stage of 9.3 feet, and an overbank velocity of 2.8 feet/second while the corresponding figures for a Standard Project Flood (SPF) would be 25,300 cfs, 11.6 feet, and 3.0 feet/second. Accompanying plates show areas subject to flooding by the SPF and IRF. The report recommends investigation and implementation of flood plain zoning ordinances, subdivision regulations, building and health codes, and several other non-regulatory measures to reduce damages. (Park-North Carolina) W75-12379

WATERFLOODING OF OILFIELDS IN WYOM!

ING TO 1968, Bureau of Mines, Laramie, Wyo. Mineral Resources Field Office. For primary bibliographic entry see Field 8B. W75-12380

HYDROGEOLOGIC DATA FOR THE LOWER CONNECTICUT RIVER BASIN, CONNEC-

Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C. W75-19954

4B. Groundwater Management

DISPLACEMENT STABILITY OF WATER DRIVES IN WATER-WET CONNATE-WATER-BEARING RESERVOIRS, Koninklijke-Shell Exploratie en. Produktie Laboratorium, Rijswijk (Netherlands).

Society of Petroleum Engineers Journal, Journal, Vol. 14, No. 1, p 63-74, February, 1974. 13 fig, 10

Descriptors: *Fluid mechanics, *Mathematical models, Saturated flow, Aquifers, Hydraulics, Hydrology, Flow, Reservoirs, Connate water, Oil

reservoirs, Groundwater.

Identifiers: *Buckley-Leverett model, *Muskat model, Displacement stability.

This study uses the Buckley-Leverett displacement model of a two dimensional reservoir con-sidering the effects of viscous and capillary forces sucring the effects of viscous and capillary forces but excluding gravitational effects. Stability criteria for the model include: (1) displacement is unstable if the mobility ratio of the fluids behind and ahead of the shock is greater than one, provided the wavelength of the instabilities is smaller than the canal width; and (2) the shock mobility is than the canal width; and (2) the shock mobility is always smaller than the end-point mobility ratio of Muskat's model of displacement. Capillary forces determine the wavelength of the instabilities, and the maximum energy dissipating wavelength dominates. This wavelength was calculated for a first-order perturbation; it is proportional to the ratio of capillary forces to viscous forces, and is a function of the progrous medium, characteristics. function of the porous medium characteristics. Experiments in a transparent flow model verified the calculations. (Bradbeer-NWWA)

HOLE-TO-HOLE GEOPHYSICAL MEASURE-MENT RESEARCH FOR MINERAL EXPLORA-

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 8G. W75-11873

GEOHYDROLOGY OF COLLIER COUNTY,

FLORIDA,
Dames and Moore, Park Ridge, Ill.
R. A. Deju, and W. L. Miller.
Southeastern Geology, Vol 16, No 1, p 67-78, August, 1971. 4 fig, 8 ref.

Descriptors: *Hydrogeology, *Florida, *Geology, Limestone, Aquifers, Groundwater, Salt marshes, Surface waters, Flow, Saline water-freshwater in-terfaces, Drainage, Hydrology, Watersheds(Basins), Water demand.
Identifiers: Collier County(Fla), Everglades,
Floridan aquifer. Tamiami Aquifer, Miocene age.

Southwestern Collier County, Florida is undergoing growth in population with consequent in-creases in their water demand. Although rainfall is creases in their water demand. Although ranntal is abundant, losses due to evapotranspiration and oceanic discharge are equally large. The subsurface geology of the two main aquifers underlying the area is discussed. Well logs, drillers logs are the main tool for understanding the subsurface geology of this low, poorly-drained, flat plain. The shallowest aquifer is composed entirely of permeshallowest aquifer is composed entirely of perme-able limestones in the Tamiami Formation. The deeper Floridan aquifer is artesian and contains two basic parts, an upper one yielding fresh water (Hawthorn Formation) a lower part yielding salt water (Tampa Formation). The two layers of the Floridan aquifer are separated by an aquiclude. Directions of flow, water quality and future poten-tial of all these hydrologic units are also examined. (Campbell-NWWA) W75-1187. er Floridan aquifer is artesian and contains

A NEW LOOK AT SANDSTONE ACIDIZING, Exxon Production Research Co., Houston, Tex.

J. L. Gidley. Petroleum Engineer, Vol 45, No 11, p 55-62, October, 1973. 1 fig, 4 tab, 1 ref.

Descriptors: *Secondary recovery(Oil), *Injection, *Oil reservoirs, Permeability, Porosity, Reservoir yield, Supply, Water supply, Water

yield, Groundwater.
Identifiers: *Sandstone acidizing, *Hydrofluoric acid, *Acid mutual solvent(AMS) technique, Ethylene glycol monobutyl ether(EGMBE).

An improved technique for the use of mixed HF-HC1 acids in stimulation of sandstone formations to increase productivity is described. This acid mutual solvent (AMS) technique is a 3-step process which involves: (1) a preflush with a regular hydrochloric acid to buffer formation waters and prevent reaction with the hydrofluoric acid;
(2) a mixed stage of HF-HCl that dissolves clay minerals to increase porosity and permeability; and (3) an afterflush using a mutual solvent such as ethylene glycol monobutyl ether (EGMBE) to remove the deposited clay minerals. Some problems associated with this treatment and their prevention are discussed. (Bradbeer-NWWA) W75-11878

GEOCHEMISTRY OF OIL-FIELD WATER AP-

PLIED TO EXPLORATION, Bureau of Mines, Bartlesville, Okla. Bartlesville Energy Research Center.

A. G. Collins.

Oil and Gas Journal, Vol 72, No 21, p 90-94, May 27, 1974. 3 fig, 25 ref.

Descriptors: *Groundwater, *Hydrocarbons, *Exploration, *Oil wells, *Geochemistry, Brines, Water types, Salinity, Iodides, Ammonium salts, Gulf of Mexico, Sandstone, Mesozoic era, Water utilization, Water chemistry.
Identifiers: Ethane, Butane, Smackover forma-

tion Cretaceous

Water is involved in the primary mechanisms that cause the accumulation, preservation, and destruction of oil and gas fields. A recent geochemical study on the Smackover (Gulf Coast-Cretaceous) indicated that knowledge of type, class, and dissolved constituents of the water is useful in exploration. The study examined reservoir samples of oil, gas, brine and rock as well as the traps involved. Certain dissolved constituents are favorable indicators of hydrocarbon accumulaition such as iodide, ammonium, organic acid salts, ethane, butane, low sulfate concentrations, and the type of class of brine. Dry-hole indicators have also been determined and listed. (Bradbeer-NWWA) W75-11879

DECIPHERING OF GROUND WATER FROM AERIAL PHOTOGRAPHS,

K. E. Nefedov, and T. A. Popova.

NASA TT F-681, 1972, 191 p. Trans of
Deshifrirovanie Gruntovykh Vod do
Aerofotosnimkam, Gidrometeologicheskoe izd., Leningrad 1969.

Descriptors: *Aerial photography, *Groundwater, *Location, Remote sensing, Mapping, Photography, Soil investigation, Distribution patterns, Cameras, Hydrogeology, Geologic control, Vegetation, Topography, Landscape.

The use of aerial photographs in groundwater stu-dies is discussed. The principles of groundwater photo interpretation, aerial photo sampling and ex-trapolation of aerial photo indexes are described. approach of acrial photo indexes are described.

A technique for medium-scale mapping of ground-water in areas of difficient precipitation is presented. A number of landscape elements and morphological units are considered in the estimation of groundwater conditions. (Bradbeer-NWWA) W75-11882

THERMODYNAMIC AND KINETIC ASPECTS OF ARGILLACEOUS SANDSTONE ACIDIZING, Institut Français du Petrole, Rueil-Malmaison J. C. Labrid.

Society of Petroleum Engineers Journal, Vol 15, No 2, p 117-128, April, 1975. 18 fig. 3 tab, 12 ref.

Descriptors: *Sandstones *Thermodynamics, *Secondary recovery(Oil), Permeability, Porosity, Injection, Rates, Concentration, Groundwater, Aquifers, Aquifer manage-

Identifiers: Hydrofluoric acid, Sandstone acidiz-ing, Dissolution, Stimulated recovery.

The thermodynamic aspect of sandstone acidizing by hydrofluoric acid (HF) is examined. Silica dissolution, with a first order in HF concentration, leads almost exclusively to the formation of fluosilicic acid. Clay and feldspar dissolution is much more complex; after a uniform alteration of the crystalline lattice, partical precipitation of sil-icic species occurs when the acid is spent. An approach to the kinetic aspect is made by defining, for a naturally complex medium, a reactivity profile that is a characteristics of the medium instead of a single reaction-rate constant. Experimental data enable a correlation between permeability, porosity, and reactivity. Also, a qualitative interpretation of acid response curves is given. The numerical simulation of the acidizing process satisfactorily reproduces the experimental results. When extended to radial flow, the model shows the influence of stimulation parameters, injection rate, concentration, and time. (Campbell-NWWA) W75-11891

A LABORATORY STUDY OF THE EFFECTS OF CONFINING PRESSURE ON FRACTURE FLOW AND STORAGE CAPACITY IN CAR-

Amoco Production Co., Tulsa, Okla.

F. O. Jones, Jr. Journal of Petroleum Technology, Vol 27, p 21-27, January, 1975. 8 fig, 22 ref.

Descriptors: *Fracture permeability, *Reservoir yield, *Compaction, *Permeability, Groundwater, Withdrawal, Hydrostatic pressure, High pressure, Petroleum engineering, Laboratory tests, Fractures(Geologic), Storage capacity, Oil. Identifiers: Net overburden pressure, Tectonophysics.

A study was made of the effects of increased net overburden pressures on fracture capacity as related to such an increase due to depletion of a fluid reservoir. Cores fabricated for controlled analysis and cores of reservoir rock samples were used similar for both sample types. A linear relationship was found between the cube root of permeability and the logarithm of confining pressure.

(Bradbeer-NWWA) W75-11892

RESERVOIR PROPERTIES AFFECTING MATRIX ACID STIMULATION OF SAND-STONES.

Chevron Oil Field Research Co., La Habre, Calif. C. C. McCune, J. W. Ault, and R. G. Dunlap. Journal of Petroleum Technology, Vol 27, p 633-640, May, 1975. 7 fig, 6 tab, 6 ref.

Descriptors: *Sandstones, *Permeability, *Flow augmentation, *Acid, *Secondary recovery(Oil), Injection, Oil reservoirs, Clogging, Porosity, Petrography, Mineralogy, Compressive strength. Identifiers: *Mineral composition, *Matrix stimulation. lation, Matrix dissolution.

Matrix stimulation means the dissolution and removal or relocation of minerals comprising the original formation matrix. A high-pressure, hightemperature acid permeameter was used in labora-tory studies of sandstone formations to learn the

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Group 4B-Groundwater Management

characteristics of a formation that make it a good or bad stimulation candidate. The age, compressive strength, mineral composition, original porosity and permeability of each of 20 samples were recoreded and compared to the response of the formation to the acid parmeameter. A single response indicator was derived from the composition, porosity and permeability of the tested sand-stone. Generally, well-consolidated sands with high quartz-clay ratios are the best acidizing candidates. (Bradbeer-NWWA)

THE USE OF A SPECIALIZED DRILLING AND GROUND WATER SAMPLING TECHNIQUE FOR DELINEATION OF HEXAVALENT CHROMIUM CONTAMINATION IN AN UN-CONFINED AQUIFER, SOUTHERN NEW JERSEY COASTAL PLAIN,

Woodward-CLyde Consultants, Clifton, N.J. For primary bibliographic entry see Field 5A. W75-11899

EUROPEAN DEWATERING SYSTEM AIDS QUEBEC PROJECT,

For primary bibliographic entry see Field 5D. W75-11918

LAND SUBSIDENCE IN THE SAN JOAQUIN VALLEY, CALIFORNIA, AS OF 1972,

Geological Survey, Reston, Va. J. F. Poland, B. E. Lofgren, R. L. Ireland, and R.

Available from Supt. of Documents, GPO, Washington, D.C. 20402, price \$2.20. Professional Paper 437-H, 1975. 78 p, 78 fig, 8 tab, 39 ref.

Descriptors: *Land subsidence, *Irrigation wells, *California, *Hydrologic data, *Well data, *Aquifer characteristics, Water level fluctuations, Drawdown, Pumping, Withdrawal, Maps, Hydrographs, Water demand, Water yields, Ground-water movment, Groundwater recharge. Identifiers: *San Joaquin Valley(Calif).

Land subsidence which began in the mid-1920's due to groundwater overdraft in the San Joaquin Valley, Calif., has caused widespread concern for the past two decades. Withdrawals for irrigation increased from 3 million acre-feet in 1942 to 10 million acre-feet 1966. Water levels declined at unprecedented rates during the 1950's and early 1960's. By 1970, 5,2000 square miles of valley land 1960 s. By 1970, 3, 2000 square miles of valley land had been affected, and maximum subsidence ex-ceeded 28 feet. Basic-data graphs and computer-plotted stress-strain relationships constitute a major part of this report. They are based on 10-13 years of detailed field measurements of both water-level change and compaction collected by the U.S. Geological Survey at 20 selected locations in the San Joaquin Valley. The recharge characteristics of a groundwater reservoir are indicated roughly by the volume ratio, which is subsidence/pumpage. In the Los Banos-Kettleman City area, the values of this ratio range from less than 0.2 near the perimeter to more than 0.6 in the central part of the area. In the corresponding parts of the Arvin-Maricopa area, the ratio ranges from near 0 to more than 0.4. (Woodard-USGS) W75-11956

LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA, PART 2. SUBSIDENCE AND COMPACTION OF DEPOSITS

Geological Survey, Reston, Va.

W. B. Bull.

Available from Sutp. of Documents, GPO, Washington, D.C. 20402, price \$2.45. Professional Paper 437-F, 1975. 90 p, 66 fig, 9 tab, 39 ref.

Descriptors: *Land subsidence, *Groundwater, *Pumping, *California, Hydrogeology, Data col-

lections, Hydrologic data, Structural geology, Compaction, Stress, Geomorphology, Aquifer characteristics, Groundwater mining, Geology, Water wells, Well data, Water utilization. Identifiers: *San Joaquin Valley(Calif).

Pumping of groundwater has increased the stresses tending to compact unconsolidated deposits by as much as 50 percent, thereby creating the world's largest area of intense land subsidence in the west-central San Joaquin Valley, Calif. As of 1966, 2,000 square miles had subsided more than I foot, and the area that had subsided more than 10 feet was 70 miles long. Maximum subsidence was 26 feet. Subsidence rates increased until the mid-1950's when the maximum observed rate was 1.8 ft per yr, but have decreased since then. During the 1963-66 period the maximum subsidence rate was only 1.1 ft per yr. Subsidence due to artesian-head decline is of greater extent and magnitude than other types of subsidence in the area. In most of the area about 70-95 percent of the compaction occurs in the lower zone below th Corcoran confining bed. As much as 30-40 percent of the compaction occurs in the upper zone in the southern part of the area. Geologic factors that cause differences in specific unit compaction include total applied stress, lithofacies, and source and mode of deposition. (Woodard-USGS) W75-11957

LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA, PART 3. INTERRELATIONS OF WATER-LEVEL CHANGE, CHANGE IN AQUITED LEVEL CHANGE, CHANGE IN AQUIFER-SYSTEM THICKNESS, AND SUBSIDENCE,

Geological Survey, Reston, Va. W. B. Bull, and J. F. Poland.

Available from Supt. of Documents, GPO, Washington, D.C. 20402, price \$1.90. Professional Paper 437-G, 1975. 62 p, 43 fig, 2 tab, 32 ref.

Descriptors: *Land subsidence, *Groundwater, *Pumping, *Aquifer systems, *California, Aquifer characteristics, Water table, Water level fluctuations, Data collections, Hydrologic data, Strucgeology, Compaction, Stress, Geomorphology, Groundwater mining, Geology, Water utiliza-tion, Water management(Applied). Identifiers: *San Joaquin Valley(Calif).

By increasing the stresses tending to compact the deposits by as much as 50 percent, man has created the world's largest area of intense land subsidence in the west-central San Joaquin Valley, Calif. As of 1966, more than 2,000 square miles had subsided more than I foot, and the area that had subsided more than 10 feet was 70 miles long. Maximum subsidence was 26 feet. The increase in stress caused by pumping of groundwater can be expressed in feet of water. A seepage of 1 foot of water occurs for each foot of head differential resulting from either artesian-head change or change in water-table position. Stress increase resulting directly from artesian-head decline has caused most of the compaction and subsidence. Changes in aquifer-system thickness may be both elastic (are reversible and occur with minor time delay) and inelastic (are irreversible and occur with large time delay). As of 1966 excess pore pressures existed in many of the aquitards and net aquifer-system expansion occurred briefly or not at all, but elastic changes did effect the monthly amounts of measured compaction. Importation of surface water has resulted in alleviation of subsidence in the Delta-Mendota Canal service area and in the vicinity of Stratford and Lemoore. (Woodard-USGS) W75-11958

WATER RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF WYOMING, MONTANA, AND NORTH DAKOTA, 1975.

Geological Survey, Denver, Colo. Water Resources Div. For primary bibliographic entry see Field 5A. W75-11961

GROUND-WATER BASIC DATA FOR EMMONS COUNTY, NORTH DAKOTA.

Geological Survey, Bismarck, N. Dak.

Geological Survey, Bismarck, N. Dak.
C. A. Armstrong.
North Dakota, Geological Survey, Bismarck,
County Ground-Water Studies 23-Part II, and
North Dakota Geological Survey Bulletin 66-Part
II, 1975. 375 p, 2 fig. 1 plate, 7 tab, 22 ref, append.

Descriptors: *Groundwater resources, *Basic data collection,s *North Dakota, *Aquifer characcollection,s *North Dakota, *Aquifer characteristics, *Water quality, Water wells, Well data, Groundwater movement, Water yield, Groundwater recharge, Transmissivity, Chemical analysis, Groundwater, Streams, Lakes, Particle size, Cores, Mineralogy, Sediments.
Identifiers: *Emmons County(N Dak).

This basic data report of groundwater in Emmons County, N.D. provides geologic and hydrologic in-formation needed for the orderly development of water supplies for municipal, domestic, livestock, irrigation, industrial, and similar uses. Specifically, the objectives were to: (1) determine the location, extent, and nature of the major aquifers and confining beds; (2) evaluate the occurrence and movement of groundwater, including the sources of recharge and discharge; (3) estimate the transmissivity of the aquifer and the potential yields of wells; (4) determine the quality of the groundwater; and (5) estimate the water use. The data were collected chiefly between 1970 and 1973 data were collected chiefly between 1970 and 1973 and consist of the following: (1) Geologic and hydrologic records for 1,193 wells and test holes; (2) water-level measurements in 76 observation wells; (3) lithologic and geophysical logs of 413 test holes and wells; (4) 265 chemical analyses of groundwater; (5) 24 chemical analyses of water from streams and lakes; (6) 14 particle-size distribution graphs; and (7) heavy mineral determinations made from three cores taken from the Fox Hills Formation. (Woodard-USGS) W75-11963

HYDROLOGIC SYSTEMS IN HAWAII,

Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.

For primary bibliographic entry see Field 2A. W75-12022

HYDROLOGICAL STUDIES OF EVAPOTRANS-PIRATION AND GROUNDWATER FLOW IN SANDY LAND,

National Research Inst. of Agricultural Engineering, Hiratsuka (Japan).
For primary bibliographic entry see Field 2D.
W75-12032

ARTIFICIAL GROUNDWATER RECHARGE, I.

CIRCULAR RECHARGING AREA, California Univ., Davis. Dept. of Water Science and Engineering. M. A. Marino.

Journal of Hydrology, Vol 25, No 3/4, p 201-208, May 1975. 4 fig, 14 ref.

Descriptors: *Artificial recharge, *Water spreading, *Numerical analysis, Digital computers, Aquifers, Water supply, Groundwater movement, Groundwater, Hydraulic properties, Hydraulic conductivity, Specific yield, Water table. Identifiers: *Spreading basins, *Groundwater mound, *Dupuit equation, Water table profiles.

Artificial groundwater recharge is of increasing importance as an essential component of water management programs. The fluctuation of the

water table in response to recharge depends on the size and shape of the recharging area, on the duration and the type of variation of the recharge rate, and on the hydraulic and geometric parameters of the underlying aquifer. Numerical solutions describing the formation of groundwater mounds were obtained by applying the Douglas-Jones predictor-corrector methods to the second order, nonlinear, partial-differential equation characterizing the unsteady flow in an unconfined aquifer beneath a circular uniformly recharging area. An advantage of using the method is that the predictor-corrector equations result in a tridiagonal set of simultaneous equations which can be solved rapidly in a digital computer. Furthermore, the method is computationally stable. (Schicht-ISWS) W75-12040

GEOCHEMISTRY OF STRONTIUM IN THE SCIOTO RIVER DRAINAGE BASIN, OHIO, Miami Univ., Oxford, Ohio. Dept. of Geology. For primary bibliographic entry see Field 2K. W75-12052

USE OF ENVIRONMENTAL ISOTOPE METHODS AS A RECONNAISSANCE TOOL IN GROUNDWATER EXPLORATION NEAR SAN ANTONIO DE PICHINCHA, ECUADOR, Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie. For primary bibliographic entry see Field 2F. W75-12080

WATER CONSUMPTION TRENDS WITHIN THE CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT, Central and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept. For primary bibliographic entry see Field 6D. W75-12085

ARTIFICAL GROUNDWATER RECHARGE, II. RECTANGULAR RECHARGING AREA, California Univ., Davis. Dept. of Water Science and Engineering. M. A. Marino.
Journal of Hydrology, Vol 26, No 1/2, p 29-37, July 1975. 4 fig, 14 ref, append.

Descriptors: *Artificial recharge, *Pit recharge, *Water table aquifers, Equations, Numerical analysis, Mathematical studies, Flow system, Hydraulic conductivity, Water table, Groundwater recharge, Water management(Applied), Storage capacity, Water supply, Water storage, Percolation, Water level fluctuations, Height, Groundwater movement.

Identifiers: *Rectangular recharge area, Alternating-direction implicit method.

The nonlinear, partial-differential equation characterizing the unsteady flow in an unconfined aquifer receiving uniform vertical recharge from a rectangular spreading basin was solved numerically. The method of solution consisted of the alternating-direction implicit scheme with an inhomogeneous grid spacing. The numerical solution for a flow system in which the rate of recharge was much smaller than the hydraulic conductivity of the underlying aquifer. The comparison showed that the values of the maximum height of the water table obtained from the numerical scheme are always higher than those calculated from the linearized solution. (Visocky-ISWS) W75-12097

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL. VOLUME

VTN, Inc., Orlando, Fla. For primary bibliographic entry see Field 5E. W75-12111 POLLUTION OF GROUNDWATER DUE TO MUNICIPAL DUMPS,

Department of the Environment, Ottawa (Ontario). Inland Waters Directorate. For primary bibliographic entry see Field 5B. W75-12119

HYDROGEOLOGICAL ASPECTS OF SOLID WASTE DISPOSAL, Wisconsin Univ., Madison. Water Resources Management Program.

Management Program.
For primary bibliographic entry see Field 5E.
W75-12121

GROUND-WATER AND ENGINEERING GEOLOGY IN SITING OF SANITARY LAND-FILLS,

Illinois State Geological Survey, Urbana. For primary bibliographic entry see Field 5E. W75-12122

THE POTENTIAL FOR ENERGY PRODUC-TION FROM GEOTHERMAL RESOURCES. Report-Subcomm. on Water and Power Resources-Comm. on Interior and Insular Affairs, U.S. Senate, 93d Cong, 1st Sess, December 1973. 40p.

Descriptors: *Geothermal studies, *Steam, *Electric power demand, Land, United States, Leases, Resources, Energy, Electricity, Electric power, Electric power production, Heat, Brines, Environment, Environmental effects, Environmental control.

Identifiers: *Environmental impact statement, Energy crisis.

The Geothermal Steam Act of 1970 was enacted to promote the orderly development of geothermal resources on public lands. The major device for achieving this objective is the authorization to the achieving this objective is the authorization to the Secretary of the Interior to issue leases for the development and utilization of geothermal resources on public lands. The Subcommittee's 1973 report found that the geothermal resources of the United States hold a potential for the production of substantial amounts of energy in the form of heat and electric power. These potential geothermal technologies offer the possibility of providing environmentally attractice energy production. Geothermal resources occur in a variety of types and situations: dry-steam systems; wet-steams systems; hot dry-rock systems; and geopressured brines. The subcommittee recommended that the Department of In-terior take steps to insure prompt issuance of final environmental impace statements, that a lead agency be designated to take responsibility for advancing geothermal energy resources and development, that exploration activity for geothermal energy resources be greatly accelerated, that research and developmental funding be increased, and that a financial assistance program be initiated to overcome some of the uncertainties associated with new technology development. (Gagliardi-Florida) W75-12199

MANAGEMENT OF INTERSTATE GROUND WATER,
Fischer and Beatty, Fort Collins, Colo.

Fischer and Beatty, Fort Collins, Colo.

W. H. Fischer.

Natural Resources Lawyer, Vol 7, No 3, p 521-5

Natural Resources Lawyer, Vol 7, No 3, p 521-546 (1974). 26 p, 85 ref.

Descriptors: *Groundwater availability, *Interstate compacts, *Equitable apportionment, Legal aspects, Legal review, Governments, State governments, Interstate commissions, Federalstate water rights conflicts.

The interstate compact and interstate litigation are presented as the best alternatives for solving managerial problems of depletion and pollution of

interstate groundwaters. Private litigation tends to be sporatic and ineffective, while uniform groundwater laws or interstate groundwater districts, are limited legally and politically. Except for pollution control, federal legislation in the area is unlikely. The interstate compact is the most effective, sound and flexible solution to the problem, but unless increased responsibility and political accountability can be expected from the states, litigation between the various states resulting in equitable apportionment of groundwater may be the only practical implement for actual management of this resource. (Knocke-Florida)

UNITED STATES V. CAPPAERT (ACTION FOR DECLARATION OF RIGHTS OF UNITED STATES TO UNDERGROUND WATERS APPURTENANT TO DEVIL'S HOLE, DEATH VALLY NATIONAL MONUMENT).
For primary bibliographic entry see Field 6E. W75.12281

RECYCLING ALLOWS ZERO WASTEWATER DISCHARGE,

DISCHARGE, Black, Crow, and Eidsness, Inc., Clearwater, Fla. For primary bibliographic entry see Field 5D. W75-12364

FLUID FLOW IN CHANNELS, CAPILLARIES, AND POROUS MEDIA UNDER THE IN-FLUENCE OF AN ELECTRIC FIELD, Bureau of Mines, Morgantown, W. Va. Petroleum Research Lab. For primary bibliographic entry see Field 2F. W75-12381

GROUND WATER AND GROUND-WATER CONTROL,

R. L. Loofbourow.

SME Mining Engineering Handbook, Vol 2, Section 26, p 26-2 to 26-55, 1973. 17 fig, 3 tab, 124 ref.

Descriptors: "Mining, "Groundwater, Drilling, Aquifer characteristics, Drainage, Wells, Dewatering, Wells, Cements, "Mine water, Permeability, Grouting, Tracers, Legal aspects, Pumping, Pumps, Water treatment, Water control. Identifiers: Pumping cost, Underground mining, Pressure tests, Drill-stem tests, Lab tests on core, Centrifugal pumps, Sumps, Pump stations, Submersible pumps, Pollution control, Pilot hole, Underground bulkheads.

Ground water flow has an important effect on the cost and progress of most mining operations. The presence of ground water limits the methods which can be used in some circumstances and presents hazards in others. However, the water table may reduce the flow of springs and wells, with legal liability. Some mine water is used directly, some must be treated before discharge, and some contains dissolved solids that can be recovered profitably. Topics covered in this chapter include: mine-water occurrence, effects and control; forecast of inflow; pumping and drainage; water in surface mining; mine-drainage pollution control; special construction for water control; and legal aspects of ground water control. (Campbell-NWWA)

FRAGMENTATION.

For primary bibliographic entry see Field 8E. W75-12387

SPECIALIZED UNDERGROUND EXTRACTION SYSTEMS.

SYSTEMS.
For primary bibliographic entry see Field 8B. W75-12388

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

CHEMICAL FRAGMENTATION, For primary bibliographic entry see Field 8E. W75-12389

WELL STORAGE, For primary bibliographic entry see Field 8B. W75-12390

BACTERIAL PROCESSES FOR IMPROVED OIL RECOVERY. Tules Univ. Okla

For primary bibliographic entry see Field 2F. W75-12391

WATER-LEVEL FLUCTUATIONS AND EARTHQUAKES ON THE SAN ANDREAS FAULT ZONE,

FAULT ZONE, Stanford Univ., Calif. Dept. of Geophysics. R. L. Kovach, A. Nur, R. L. Wesson, and R.

Geology, Vol 3, No 8, August, 1975. p 437-440, 2 fig. 17 ref.

Descriptors: *Water wells, Aquifer characteristics, Earthquake engineering, Seismic waves, *Faults(Geologic), Ground water, *California, Earthquakes, *Water level fluctuations. Identifiers: *San Andreas Fault Zone(Calif.), Creep events, In situ pore pressure changes, Zone of active tectonic creep, Zone of seismicity.

Observations of the water-level changes in a well drilled into the San Andreas fault zone have been under way since May, 1971, with the objective of studying in situ pore pressure changes in a zone of active tectonic creep and seismicity. Small water-level changes, characterized by a decrease and subsequent rise have been followed by aerthquakes of moderate size on the San Andreas fault zone. Compatibility of these observations with either a dilatancy-type behavior or a dislocation-type behavior for the pre-earthquake process can be demonstrated. Additional water-level observations at other sites in the fault zone are needed to examine the spatial and temporal extent of the actual preseismic process that is responsible for observed creep events, water-level changes, and tilt changes. (Campbell-NWWA)

CEMENTING OFF, PLUGGING, AND REDRILLING,
Dow Chemical Co., Tulsa, Okla. Dowell Div. For primary bibliographic entry see Field 8F. W75-12394

CONTROL OF GROUNDWATER AT BAN-CROFT MINES, ZAMBIA, W. J. Whyte, and R. A. Lyall.

W. J. Whyte, and K. A. Lyan.
In: Ninth Commonwealth Mining and Metallurgical Congress 1969, Mining and Petroleum Geology Section, Paper 16, 32 p, 13 fig, 2 tab, 6 ref.

Descriptors: *Groundwater, Wells, *Mining, *Dewatering, Aquifer characteristics, Drilling, Hydrogeology, Groundwater recharge, Pumping, *Africa.

Identifiers: Wet mine, *Zambia, Surface drainage modifications, Cone of dewatering.

Bancroft Mines, Ltd., a copper-producing company situated at the northern end of the Zambian Copperbelt, hoisted 160,000 tons of ore per month and pumped an average daily volume of 65,000,000 gal of water to surface in mid-1968. The large volumes of water encountered and expected during mining are a major consideration in mine planning. The progress of dewatering relative to stoping is checked by regular estimates of the water level in each main aquifer, by underground observations, pressure measurements on underground boreholes and water-level measurements in surface boreholes. The main pumping in-

stallations at the mine are currently capable of delivering to surface a sustained volume of 75,000,000 gal/day. Underground water control measures in the event of a major power failure involve the flooding of selected levels, providing a no-pumping storage capacity of not less than four hours before shaft installations are affected. On surface, extensive modifications have been made to the natural drainage in order to divert a major tributary of the Kafue River from an area subject to caving overlying the orebodies and to increase runoff during seasonal storms and, hence, reduce recharge into the aquifers. An understanding of the geological characteristics of the various aquifers and an appreciation of the reliability or limitations of available geological data are essential to any assessment of the water hazards involved in underground development at Bancroft. (Campbell-NWWA)

RECENT APPLICATION OF GEOPHYSICAL METHODS IN COAL MINING, National Coal Board, London (England).

National Coal Board, London (England). For primary bibliographic entry see Field 8B. W75-12396

TURBO-DRILLING AS APPLIED TO POTASH DEVELOPMENTS IN THE SASKATCHEWAN FIELD,

Cementation Mining, Ltd., London (England). For primary bibliographic entry see Field 8B. W75-12397

APPLICATION OF WELL LOGGING TECHNIQUES TO MINING EXPLORATION BOREHOLES,

British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre. For primary bibliographic entry see Field 8G. W75-12398

FRESH WATER STRATA OF MISSISSIPPI AS REVEALED BY ELECTRICAL LOG STUDIES, Millsaps Coll., Jackson, Miss.

R. R. Priddy.
Mississippi State Geological Survey, Jackson, Bull
83, 71 p, 1955. 7 fig, 1 tab.

Descriptors: *Groundwater, *Water wells, Well logging, *Subsurface waters, Water quality, Mississippi, Electrical logging, *Drilling, Oil wells. Identifiers: *Fresh-water sands, Paleozoic aquifers, Tertiary aquifers, Mesozoic aquifers.

The probable geographic (Lateral) distribution of the subsurface fresh-water-bearing sands of Mississippi and their stratigraphic (Vertical) distribution were determined by a study of nearly 500 electric logs of oil tests, selected from more than 3,500 logs. Most of the data-distribution of wells, and number and stratigraphic position of the aquifers they show-were obtained from 158 logs. The overall purpose of the investigation was to provide aid for planning to drill for drinking water, water for industrial use, or water for agricultural use. (Campbell-NWWA) W75-12399

HYDROGEOLOGIC DATA FOR THE LOWER CONNECTICUT RIVER BASIN, CONNECTICUT.

Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C. W75-19954

WATER-QUALITY DATA, 1948-73, ANCHORAGE AND VICINITY, ALASKA, Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 5A. W75-19955

4C. Effects On Water Of Man's Non-Water Activities

CRITICAL CHOICES SAVE SHORELINE, For primary bibliographic entry see Field 6G. W75-12231

4D. Watershed Protection

TRAINING OF SUTLEJ RIVER BELOW RUPAR HEADWORKS FOR THE PROTECTION OF BIST DOAB CANAL: MODEL STUDIES, Hydraulic Research Station, Malakpur(India).

Hydraulic Research Station, Malakpur(India). G. Singh, and B. D. Sharma.

Indian Journal of Power and River Valley Development, Vol. 22, No. 12, p 479-484, December, 1972. 8 fig, 1 tab.

Descriptors: *Model studies, *Erosion, *Rivers, River training, Bank erosion, Erosion control, Bank protection, Structural models. Identifiers: *India, Armored spurs.

The Sutlej River below Rupar Barrage, India, started eroding its right bank opposite the Bist Doab Canal, which runs parallel. The river edge had come as close to the canal as 48.77 meters. The Punjab Irrigation and Power Research Institute investigated remedial measures to check further erosion of the river bank. A model of Sutlej River, Rupar Barrage, and the necessary reach of the Bist Doab Canal was constructed to a horizontal scale of 1/150 and a vertical scale of 1/30. The model was run with different discharges and different remedial measures were examined. Ultamately a scheme comprising construction of three armored spurs, each 33.53 meters long, on the right bank of the river was finalized. Balli sarkanda spurs were constructed in 1970. These temporary structures function satisfactorily and give the necessary protection to the right bank. (Sandoski-FIRL) W75-11925

EFFECTS OF MOVEMENT OF PRECIPITA-TION AREA UPON RUNOFF PHENOMENA, Tokyo Univ., (Japan). Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W75-12026

NUMERICAL SIMULATION OF WATERSHED HYDROLOGY,
Texas Univ., at Austin. Dept. of Civil Engineering.

Texas Univ., at Austin. Dept. of Civil Engineering For primary bibliographic entry see Field 2A. W75-12027

A THREE-COMPONENT, NONLINEAR WATER-VIELD MODEL,
Agricultural Research Service, Athens, Ga.

Southeast Watershed Research Center. For primary bibliographic entry see Field 2A. W75-12031

INTRODUCTION OF SHORE EROSION CONTROL LEGISLATION. For primary bibliographic entry see Field 6E. W75-12279

FLOOD PLAIN INFORMATION: HASSAYAM-PA RIVER, VICINITY OF WICKENBURG, ARIZONA.

Army Engineer District, Los Angeles, Calif. For primary bibliographic entry see Field 4A. W75-12370

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

RELATIVE THROUGHFALL ENRICHMENT BY BIOLOGIC AND BY AEROSOL-DERIVED MATERIALS IN LOBLOLLY PINES, Mississippi Univ., University. Dept. of Geology and Geological Engineering.

For primary bibliographic entry see Field 5B. W75-11853

OBSERVATIONS ON THE ATOMIC ABSORP-TION BEHAVIOR OF SOME OF THE EARTH

TION BEHAVIOR OF SUBJE OF THE EXEMENTS,
Pye Unicam Ltd., Cambridge (England).
D. R. Thomerson, and W. J. Price.
Analytica Chimica Acta, Vol. 72, No. 1, p. 188193, September 17, 1974, 1 fig, 3 tab, 15 ref.

Descriptors: *Analytical techniques, metals, *Trace elements, *Spectrophmetry, *Pollutant identification.

Identifiers: Interferences, *Rare earth elements, *Atomic absorption spectrometry, Gadolinium, Dysprosium, Neodymium, Samanium, Yttrium.

The inherently poor sensitivities and detection limits for most of the rare earth elements, when compared with some of the more common ele-ments, makes difficult the application of atomic absorption to the determintation of trace concentrations. Many chemical interferences occur in the determination of these elements. This was confirmed by measuring the absorbance of the elements Gadolinium, Dysprosium, Neodymium, Samarium and Yttrium in a mixed solution on a Unicam SP1900 double beam spectrophotometer, and comparing the results with the absorbance of their individual solutions. Careful attention must be given to the problem of interferences arising from minerial acids and other rare-earth elements: also the critical nature of the basic instrumental parameters must be realized. (Delfiner-Vanderbilt)
W75-11862

TOXICITY OF COPPER COMPLEXES TO RFRESHWATER MOLLUSKS.

For primary bibliographic entry see Field 5C. W75-11863

THE USE OF A SPECIALIZED DRILLING AND THE USE OF A SPECIALIZED DRILLING AND
GROUND WATER SAMPLING TECHNIQUE
FOR DELINEATION OF HEXAVALENT
CHROMIUM CONTAMINATION IN AN UNCONFINED AQUIFER, SOUTHERN NEW JERSEY COASTAL PLAIN,

Woodward-CLyde Consultants, Clifton, N.J. B. S. Yare.

Geology and Ground Water, Vol 1, p 151-154, April, 1975, 4 fig, 1 tab, 5 ref.

Descriptors: *Groundwater, Pollution, *Sampling, *Tracking techniques, *Testing procedures, Aquifers, Chromium, Measurement, Drilling samples, Drilling, Drill holes, Well data, Well screens, Test wells, *New Jersey, Coastal plains, Pollutant identification, Water pollution sources.

Identifiers: Unconfined aquifer, Hexavalent

A technique for sampling formation water at specific horizons during drilling was developed in an investigation of contamination by chromium. The technique consists of: (1) drilling a borehole to the base of a sampling horizon; (2) lowering a wirewound well screen and riser pipe to the bottom of the hole and gravel-packing the screen; (3) pump-ing the borehole well until the discharge is clear of drilling fluid; and (4) pumping at least 100 gallons of formation water before collecting the sample and performing field water quality tests. Analysis of water samples withdrawn from five wells. drilled to and screened at specific depths, verified the new technique was valid. This new procedure was then used to substantiate surface earth-resistivity data and determine the vertical distribution of the contaminant with time as the wells are also screened for sampling after drilling completion. (Bradbeer-NWWA) W75-11899

RADIOISOTOPE MONITORING SYSTEM FOR SEWAGE EFFLUENT, California Univ., Livermore. Lawrence Liver-

more Lab.

J. L. Cate, Jr., and T. O. Hoeger. American Industrial Hygiene Association Journal, Vol. 33, No. 10, p 693-699, October, 1972. 6 fig, 1

Descriptors: *Monitoring, *Sewage effluents, Radioisotopes, California, *Pollutant identifica-

Identifiers: Alarm systems.

An automatic, on-line monitoring system for the sanitary sewage effluent from the Lawrence Livermore Laboratory in California has been constructed. It can detect, at levels lower than United States Atomic Energy Commission guidelines, all radioisotopes in use at the Laboratory, and it monitors pH continuously. It is wired into a central alarm system which alerts personnel on a 24-hour basis. (Sandoski-FIRL) W75-11914

MEASUREMENT OF EXTREMELY SMALL PRESSURE DIFFERENCES IN WATER Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics. For primary bibliographic entry see Field 7B. W75-11915

COMPUTER SYSTEM MONITORS BATON ROUGE SEWERS. For primary bibliographic entry see Field 7C. W75-11927

COMPUTER'S MASTER PLAN SIGNALS SEWER PROBLEMS BEFORE THEY START, Thousand Oaks Utilities Dept., Calif For primary bibliographic entry see Field 7C. W75-11928

THE MANAGEMENT OF WATER IN NORTHERN IRELAND, WITH PARTICULAR REFERENCE TO WATER POLLUTION, For primary bibliographic entry see Field 5G.

MERCURY CONCENTRATIONS IN OPEN OCEAN WATERS: SAMPLING PROCEDURE, Connecticut Univ., Groton. Marine Sciences Inst.; and Connecticut Univ., Groton. Dept. of Geology. W. F. Fitzgerald, and W. B. Lyons. Limnology and Oceanography, Vol 20, No 3, p 468-471, May, 1975. 1 tab, 18 ref.

Descriptors: *Heavy metals, *Mercury, Analytical techniques, *Oceans, *Sea water, *Sampling, Trace elements. Atlantic Ocean, *Pollutant techniques, *Oceans, *Sea water, Trace elements, Atlantic Ocean, Trace eleme Identifiers: Teflon ware, PVC.

Accurate Hg determination in sea water depends Accurate hig octermination in sea water depends significantly on careful sampling at sea and on the sample storage procedure. Unusually large blank values were occasionally observed both for pyrex containers, and glass BOD bottles. Collections made in PVC samplers and relatively expensive Teflonware showed no significant difference.

Cold-trap preconcentration was followed by measurement of Hg by gas phase atomic absorption spectrophotometry. The PVC sampler was found suitable for collecting sea water samples at depth for Hg determinations. Hg concentrations averaged 8 plus or minus 3 ng per liter in surface water in the northwest Atlantic ocean. (Delfiner-W75-11953

WATER RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF WYOMING, MONTANA, AND NORTH DAKOTA, 1975.

Geological Survey, Denver, Colo. Water Resources Div. Open-file report, May 1975, 110 p, 27 fig, 27 ref.

Descriptors: *Water resources development, *Water quality, *Projects, *Coal mine wastes, *Great Plains, Wyoming, Montana, North Dakota, Water pollution sources, Programs, Evaluation, Data collections. Chemical analysis, Sediment transport, Streamflow, Groundwater resources, Observation wells, Water quality control.

Identifiers: *Northeast Great Plains, *Coal regions(U.S.).

The Geological Survey's Water Resources Division has for many years maintained a program of water-resources investigations that includes the water-resources investigations that includes the coal regions of Wyoming, Montana, and North Dakota. The recent interest in coal has added new dimensions and greater intensity to the investigations. The work has expanded to include monitoring the environmental effects of coal mining and processing and to determine the availability of additional water supplies for coal-conversion plants and related demands. This report describes the water-resources investigation program that is cur-rently in operation. Locations of gaging stations and water-quality measuring sites, frequencies and parameters, and areas of groundwater studies are included. Brief descriptions of coal-related studies by investigators who are headquartered outside the Northern Great Plains coal regions are also included. Such studies are research in topics related to coal extraction, water supply, and post-mining reclamation. (Woodard-USGS) W75-11961

WATER RESOURCES DATA FOR CALIFORNIA, 1973: PART 2. WATER QUALITY NIA, 1973 RECORDS.

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 7C. W75-11962

GROUND-WATER BASIC DATA FOR EMMONS COUNTY, NORTH DAKOTA, Geological Survey, Bismarck, N. Dak. For primary bibliographic entry see Field 4B. W75-11963

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 6. MISSOURI RIVER BASIN. Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-11964

QUALITY OF SURFACE WATERS OF THE QUALITY OF SURFACE WATERS OF UNITED STATES, 1970: PART 8. WEST GULF OF MEXICO BASINS. Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-11965

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 8. WESTERN GULF OF MEXICO BASIN. Geological Survey, Reston, Va.

Group 5A-Identification Of Pollutants

For primary bibliographic entry see Field 7C. W75-11966

PHOTOGRAPHIC QUANTIFICATION WATER QUALITY IN MIXING ZONES, Wisconsin Univ., Madison. Inst. for Environmental Studies.

T. M. Lillesand, F. L. Scarpace, and J. L. Clapp. Available from the National Technical Informa-tion Service, Springfield, Va. 22161 as N74-20016. NASA-CR-137268 (Undated). 26 p, 8 fig, 2 tab, 19 ref. NASA NGL 50-002-127.

Descriptors: *Aerial photography, *Analytical techniques, *Water pollution, *Waste dilution, Spectrophotometry, Mixing, Pulp wastes, Wisconsin, Discharge measurement, water(Pollution), Suspended solids. Identifiers: *Mixing zone, Kim Corp.(Wis.), Fox River(Wis.). Kimberly-Clark

To quantitatively delineate waste concentrations throughout waste effluent mixing zones, a method was developed based on densitometric measure ments obtained from aerial photography. Simultaneously acquired color infrared photography and suspended solids water samples were used to delineate the mixing zone resulting from discharge of a Kimberly-Clark paper mill effluent at Kimberley, Wisconsin. A mixing zone is defined as the ex-tent a receiving water body utilizes to dilute a waste discharge to a concentration characteristic of a totally mixed condition. Digital scanning microdensitometer data was used to estimate and delineate suspended solids concentrations on the basis of a semi-empirical model. It is shown that photometry, when predicated on a limited amount of ground sampling, can be used to measure and define mixing zone waste distributions are reliably and in more detail than conventional surface measuring techniques. The method has direct application to the establishment of definite and rational water quality guidelines, the development of sam-pling and surveillance programs for use of government and primate agencies, and the development of design and location criteria for industrial and municipal waste effluent outfalls. (Buchanan-Davidson--Wisconsin) W75-11970

THE RISK OF DEOXYGENATION OF WATER IN HERBICIDE APPLICATION FOR AQUATIC WEED CONTROL, University of Wales Inst. of Science and Tech.,

M P Brooker

Journal Institution of Water Engineers, Vol 28, No 4, p 206-210, 1974. 2 fig, 1 tab, 9 ref.

Descriptors: *Aanerobic conditions, *Herbicides, *Aquatic weed control, *Oxygen demand, Diquat, Paraquat, Submerged plants, Aerobic conditions, Aquatic plants, Decomposing organic matter, Phytoplankton, Fishfill, Estimating, Equations,

Identifiers: Barry Reservoir(Wales), Oxton Lake(England).

One danger of application of herbicides (such as diquat and paraquat) to control aquatic submerged plants is risk of water deoxygenation due to aerobic decomposition of dead plant material. Aerobic decomposition of aquatic macrophytes and phytoplankton can be described by a first order equation relating rate of decomposition change to biodegradable mass. A scheme is described to enable those responsible for water management to as-sess the risk of deoxygenation during herbicide application. Dissolved oxygen concentration levels to avoid fish mortality can be calculated. Oxygen resources available for aerobic decay processes in relation to oxygen requirements for fish survival at varying water depths and the maximum plant freshweight per unit area which can be treated with herbicide without producing severe water deoxygenation can be calculated. Hypothetical examples of how to assess deoxygenation risk are ampies of now to assess deoxygenation risk are presented. The method was used successfully in Barry Reservoir, South Wales, but minimum recorded oxygen concentrations were higher than predicted; no fish deaths were recorded. In Oxton Lake, Nottinghamshire, treatment with paraquat resulted in reduction in dissolved oxygen concentrations and fish deaths occurred; the predicted minimum concentration was higher than the observed minimum concentration. (Buchanan-David-

ENVIRONMENTAL RESEARCH LABORATORIES, 1973 ANNUAL REPORT.

National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospher-

ic Turbulence and Diffusion Lab.
Report ATDL-106, Air Resources Atmospheric
Turbulence and Diffusion Laboratory, Oak Ridge,
Tennessee, December 1974, 310 p.

Descriptors: *Air pollution, *Model studies, *Dispersion, *Fallout, Atmosphere, Mathematical models, Distribution patterns, Meteorology, Coolmodels, Distribution patterns, Meteorology, Com-ing towers, Deciduous forests, Evaporation, Smog, Solar radiation, Pollutants, Hygrometry, Theoretical analysis, On-site investigations, Rural areas, Cities, Path of pollutants. Identifiers: *Plumes, Photochemical smog.

Research contributions for 1973 were compiled. Titles of the 14 contributions are: Distribution of Solar Radiation within a Deciduous Forest; A Note on the Elevation of the Mean and the Mo of the Gaussian Concentration Distribution: Lidar vs. Photometer, a One Month Comparison; Application of a Simple Dispersion Model to a Rural In-dustrial Region; The Simple ATDL Urban Air Pol-lution Model; Diffusion Estimation for Small Emissions; Parameterization of Surface Moisture and Evaporation in a Planetary Boundary Layer Model; The Form of the Frequency Distribution of Air Pollution Concentrations; Application of a Simple Model of Photochemical Smog; Urban Air Pollution Models - Why; Radiation Doses from Hypothetical Exposures to Rulison Gas; Estimates of Dry Deposition and Plume Depletion Over Forests and Grassland; Meteorological Effects of the Cooling Towers at the Oak Ridge Gaseous Diffusion Plant. Part I. Description of Source Parameters and Analysis of Plume Photographs and Hygrothermograph Records; and Theoretical Estimates of Lift-Off of Buoyant Gas Initially on the Ground. (See W75-12034 thru W75-12039) (Humphreys-ISWS) W75-12033

DISTRIBUTION OF SOLAR RADIATION WITHIN A DECIDUOUS FOREST, National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab. For primary bibliographic entry see Field 2I. W75-12034

A NOTE ON THE ELEVATION OF THE MEAN AND THE MODE OF THE GAUSSIAN CON-

CENTRATION DISTRIBUTION,
National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab. F. A. Gifford.

In: 1973 Annual Report; Report ATDL-106, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 31-35, December 1974. 2 fig.

Descriptors: *Model studies, *Mathematical models, *Powerplants, *Path of pollutants, Equations, Winds, Average, Distribution patterns, At-

mosphere, Air pollution. Identifiers: *Plumes, Plume models, Concentration distributions, Powerplant stacks, Gaussian In an infinite atmosphere with constant wind, u, the elevation of a Gaussian plume would be con stant. The usual assumption of complete ground reflection alters this, as would the assumption of absorption. In view of the widespread use of this plume model, it is of interest to obtain the equations governing the height of the mean and the mode of the concentration distribution. The behavior exhibited by these curves agrees at least qualitatively with what would be expected. Near the stack both the mean and the mode are located at stack height. Farther downwind, near the point at which the vertical spreading, sigma sub z, grows to near the stack height, the pattern changes. The height of the mean then increases for both reflection and absorption as sigma sub z increases, whereas, for reflection, the mode decreases abruptly to zero. (See also W75-12033) (Sims-W75-12035

LIDAR VS. PHOTOMETER, A ONE MONTH

National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab. W. M. Culkowski, and S. D. Swisher.

In: 1973 Annual Report; Report ATDL-106, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 37-46, December 1974. 4 tab, 6 ref.

Descriptors: *Air pollution, *Instrumentation, *Measurement, Turbidity, Photometry, Remote sensing, Optical properties, Air environment. Identifiers: *Lida, Particulates.

Results were presented for September 1972 of a comparison between turbidity data and lidar backscattering data. Correlations of +0.99 were obtained for one set of data, but on a semilogarithmic rather than linear basis. The monthly turbidity from the photometer averaged 0.281 (10 cases). The turbidity derived from the lidar reading was 0.305 (20 cases). Comparisons with a distant particulate sensing station were also presented. The correlation between Oak Ridge lidar and Chattanooga particulate matter suggested that most particulate matter observed is from natural, or at least ubiquitous, sources. (See also W75-12033) (Sims-ISWS) W75-12036

APPLICATION OF A SIMPLE DISPERSION MODEL TO A RURAL INDUSTRIAL REGION, National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab. S. R. Hanna.

S. N. Hanna. In: 1973 Annual Report, Report ATDL-106, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 47-62, December 1974. 4 fig, 4 tab, 10 ref.

Descriptors: *Model studies, *Air pollution, *Tenneessee, *Dispersion, Mathematical models, Powerplants, Industries, On-site data collections, Winds, Wind velocity, Pollutants, Path of pollutants, Rural areas.

Identifiers: *Particulate concentrations.

A simple dispersion model for multiple point and area sources was applied to the Rockwood-Harriman, Tennessee, region, which contains two small towns and two major industries. Predicted annual average suspended particle concentrations were well correlated (r = 0.95) with observations at four stations. Variations in daily average concentrations at the four stations were partly accounted for (r = 0.5) by variations in daily average wind speed. (See also W75-12033) (Sims-ISWS) W75-12037

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5 Identification Of Pollutants—Group 5A

THE SIMPLE ATDL URBAN AIR POLLUTION MODEL.

National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab. F. A. Gifford.

In: 1973 Annual Report, Report ATDL-106, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 63-81, December 1974. 2 tab, 16 ref, 1 append.

Descriptors: *Model studies, *Mathematical models, *Air pollution, *Cities, Path of pollutants, Pollutants, Industries, Diffusion, Air circulation, Atmosphere.
Identifiers: *Pollutant concentrations.

The simple urban air pollution model in use at the Atmospheric Turbulence and Diffusion Laborato-Atmospheric furouence and Diffusion Laboratory, Oak Ridge, was described. Experience with this model was reviewed. The ATDL philosophy of air pollution modelling was discussed. It was shown that this simple model consistently gave slightly better results than more complex models. It was argued that some of the more complex models have been pushed on too rapidly with theoretical modelling without adequate experimental checks against the real atmosphere. (See also W75-12033) (Sims-ISWS)

W75-12038

DIFFUSION ESTIMATION FOR SMALL EMIS-

SIONS, National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab. G. A. Briggs. In: 1973 Annual Report; Report ATDL-106, Air

Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 83-145, December 1974. 4 fig, 1 tab, 19 ref, 5 append.

Air pollution, Fallout, Poll-Dispersion, Fallout, Pollutants, Effluents, Powerplants, Industries, Industrial wastes, Buoyancy, Winds, Wind velocity, Path of pollutans, Air circulation.

Identifiers: *\$\(\frac{2}{3}\)

Identifiers: *Stack effluents, Small emission, Aerodynamic effects, Particle concentrations, Ground level concentrations.

A simplified approach to the calculation of ground level concentrations of effluents from sall industri-al and fuel burning installations was described. It was intended to serve as a first approximation to a very complex process. Because each stack, build-ing, and terrain configuration is different, actual ground concentration may frequently differ from the calculated values by a factor of two. Nonetheless, this procedure should be useful for determing whether ambient air quality standards are likely be met, exceeded, or only marginally obtained. It also predicts the locations where the highest and most frequent ground concentrations are likely. Sampling at several such locations is very advisable, unless the predicted concentrations are quite low. These procedures were designed especially for source heights of less than 100 m. Some of the simplifications made are not valid for large emissions. (See also W75-12033) (Sims-ISWS)
W75-12039

INFLUENCE OF ENVIRONMENTAL STRESS ON ENUMERATION OF INDICATOR BAC-TERIA FROM NATURAL WATERS, Montana State Univ., Bozeman. Microbiology.
For primary bibliographic entry see Field 5C.
W75-12053

VIRUS REMOVALS IN TRICKLING FILTER PLANTS.

For primary bibliographic entry see Field 5D. W75-12068

INORGANICS, (LITERATURE REVIEW), Tennessee Univ., Knoxville. Dept. of Civil En-

gineering. R. A. Minear, J. S. Henderson, C. L. McEntyre, and R. R. Rose.

Journal Water Pollution Control Federation, Vol 47, No 6, p 1118-1162, June, 1975, 429 ref.

*Water Descriptors: *Reviews, *Water analysis, *Chemical analysis, *Inorganic compounds, Lakes, Rivers, Oceans, Radiochemical analysis, Neutron activation analysis, Spectrophotometry, Colorimetry, Sampling, *Bibliographies, *Pollutant identification.

An in-depth review of current literature on the nature and analysis of chemical species, with inorganics in particular, is presented. Water samples from various types of oceans, lakes, and rivers as well as effluent discharges were analyzed. Sample concentration and separation techniques are described. Much literature has been reported on the application of instrumental techniques including atomic absorption spectrophotometry, flame-less atomic absorption, atomic fluorescence, emission spectroscopy, gas and liquid chromatog-raphy, electrochemical analysis, neutron activa-tion analysis, and other radiochemical techniques. Tables are given for a cross reference to the specific analytical methods and individual constituents. Colorimetric and titrimetric methods were conducted for halogens, ozone, sulfur com-pounds, cyanide, boron, silicon, phosphorus, nitrogen, iron, manganese, and aluminum, as well as for various transition metals. (Kramer-FIRL)

WATER CHARACTERISTICS. (LITERATURE) REVIEW), Maine Univ. Orono.

J. A. Olofson, and M. M. Ghosh. Journal Water Pollution Control Federation, Vol 47, No 6, p 1161-1169, June, 1975, 73 ref.

Descriptors: *Reviews, *Water analysis, Heavy metals, Analytical techniques, Eutrophication, Water quality, Water chemistry, Suspended solids, Turbidity, Odor, Toxicity, *Bibliographies, *Pollutant identification. Identifiers: Ligands, Voltammetry, Spec-

trophotometry.

A review of the literature on analytical techniques for determination of water characteristics is presented. Attention has been given to the finding of heavy metals and associated ligands in natural waters. Analytical procedures such as voltammetry and pulse polarography are described. Naturally occurring Fe fractions in seawater have been examined. Calculations have also been made to assess the degree to which Hg(II), Cd(II), Zn(II), and Pb(II) form complexes with hydroxyl and chloride ions in natural systems. Transport of heavy metals by water and bottom sediments has been investigated. Other methods of water analysis were atomic absorption spectrophotometry for arsenic determination, uv and visible spectrophotometric methods for trace metal speciation, and liquidliquid extraction of organic compounds. Further studies included the retention of phosphate and sulfate by muscovite, thermal aspects of aquatic chemistry as related to effects upon physicalchemical parameters, and a phosphorus model re-lated to lake eutrophication. A new index of water quality has been proposed, based on temperature, nutrients, ss, turbidity, coliform bacteria, DO, color, odor, and toxicity; it has been applied to surface waters in Tennessee. Reviews have also been made of various aspects of natural water chemistry with regard to bioassay evaluation of water quality. (Kramer-FIRL) W75-12073

TREATMENT PLANT TO BE TESTED FOR CARCINOGENS, Western Kentucky Univ., Bowling Green. Dept.

of Engineering Technology.

For primary bibliographic entry see Field 5F. W75-12130

BIOCHEMICAL CHARACTERISTICS DIGESTED CHEMICAL SEWAGE SLUDGES, Environmental Protection Service, (Ontario). Water Technology Centre. Ottawa For primary bibliographic entry see Field 5D. W75-12132

VIRULOGICAL INVESTIGATIONS SLUDGES FROM SELECTED ON SEWAGE PLANTS, Ontario Missiana, ONTARIO

Ontario Ministry of Health, Toronto.
For primary bibliographic entry see Field 5D. W75-12133

ANALYSIS OF HEAVY METALS IN SEWAGE SLUDGE AND LIQUIDS ASSOCIATED WITH SLUDGES.

Toronto Univ. (Ontario). Dept. of Geology; and Toronto Univ. (Ontario). Dept. of Chemistry, J. C. Van Loon.

In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 234-248. (1974) 9 tab,

Descriptors: *Analytical techniques, *Heavy metals, *Sewage sludge, *Pollutant identification, Iron, Lead, Copper, Cadmium, Nickel, Zinc.

The equipment and techniques for the analysis of heavy metals in sewage sludge and liquids associated with sludges are presented. It is questionable whether a grab sludge sample can be considered as representative of the sludge in a digester tank. Data presented suggest that the majority of the sludge water metal is bound tightly and therefore is not readily detectable using ex-tractable metal procedures. Nickel, copper, and cadmium appear to be little affected by filter porosity size. Lead was found in the solids residue trapped by a 60 micron porosity filter. The metal contents of sludges ranged from: 2-147 ppm Cd; 16-16000 ppm Cr; 85-4000 ppm Pb; 7-1500 ppm Ni; 162-3000 ppm Cu; 1-24 ppm Hg; 60-500 ppm Mn; 4-60 ppm Ag; 610-19000 ppm Zn; 0.33-7.4 ppm Fe; and, 0.10-3.9 ppm Al. The analytical techniques used allowed the detection of cadmium and zinc above 0.2 ppb and the detection of iron, lead, copper and nickel above 1.0 ppb. The high metal ls detected in sewage treatment plant products in this study demonstrate a need for research into the fate of these metals after reacting with terrestrial and acquatic environments. (See also W75-1715) (Orr-FIRL) W75-12140

CHEMICAL TESTS FOR PLANT AVAILABLE

METALS IN SOILS.
Guelph Univ. (Ontario). Dept. of Land Resource

T. E. Bates, and A. Haq.
In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974,
Toronto, Ontario, Canada, p 267-268. (1974) 3 ref.

Descriptors: *Soils, *Nutrients, Crops, Sewage studge, *Cadmium, *Copper, *Metals, Pollutant identification, Canada. Identifiers: Ontario, EDTA, DTPA, Ammonium

The amount of nutrient in soil available to plants is not necessarily related to the total amount in the soil. A study is now in progress to determine a suitable extractant to measure plant available metals in soils in Ontario. Emphasis has been placed on cadmium and copper which are impor-tant pollutants of sewage sludge. Thirty-five soils with varying amounts of copper and cadmium con-tamination have been collected in Ontario. Swiss Chard has been grown on the soils. An analysis

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will be made of the chard to determine the metal content in soils extracted with EDTA, DTPA, ammonium acetate, and other chemicals. The metal extracted from the soils will be correlated with the metal uptake by the Swiss Chard. It is hoped that this experiency are swiss chard. It is noped that this experient will determine an extractant that will give satisfactory measure of plant available metals. (See also W75-11715) (Dean-FIRL) W75-12142

PRIMARY DEVELOPMENTS OF AIR-BORNE BACTERIA IN THE OECD ACTIVATED SLUDGE SYSTEM,

CIBA-GEIGY Ltd., B. Dyestuffs and Chemical Div. Basel For primary bibliographic entry see Field 5D. W75-12143

DETECTION OF POLLUTANTS BY FISH W. E. Jones.

Water Treatment and Examination, Vol 24, pt 2, p 132-139, 1975, 1 tab.

*Pollutant Descriptors: identification. "Methodology, "Freshwater fish, Toxicity, Metals, Halogenated pesticides, Organic com-pounds, Organophosphorus pesticides, Paraquat, DDT, Zinc, 2-4D, Dieldrin, Endrin, Flourine, Cadmium, Chromate, Mercury, Fish physiology, Lethal limit, Laboratory tests, Bioindicator. Identifiers: Bioaccumulation, Corp. Endosulphan, reticulatus, MCPA, BHC, Endosulphan, Parathion, Demeton, Phenkapton, Rotenone, Acetonitrile, Alkybenzene Trichloroethylene, Acetonitrile, sulphonate, Cyanide.

Methodology for toxicity testing and the effects of various toxins on guppies, Lebistes reticulatus, were described. Concentrations of the toxic agents, period of exposure, and reactions were recorded. The toxic agents included Cd, Cr, Hg, Zn, F, CN, 2-4D, MCPA, Paraquat, BHC, DDT, Dieldrin, Endrin, Endosulphan, Parathion,
Demeton, Phenkapton, Rotenone, Rotenone, Trichloroethylene, Acetonitrile, and Alky benzene sulphonate. (Katz) W75-12193

NITROGEN, PHOSPHORUS, AND EUTROPHICATION IN THE COASTAL MARINE ENVIRONMENT,

Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 5C. W75-12236

COLUMN SETTLING TESTS FOR FLOCCU-LANT SUSPENSIONS,

Envirex, Inc. Milwaukee, Wis. Environmental Science Div.

For primary bibliographic entry see Field 5D. W75-12322

APPLICATION OF THE METHYLTHYMOL BLUE SULFATE METHOD TO WATER AND WASTEWATER ANALYSIS,

Ontario Ministry of the Environment, Rexdale, Water Ouality Branch. J. M. Adamski, and S. P. Villard. Analytical Chemistry, Vol 47, No 7, p 1191-1194, June, 1975. 3 fig, 2 tab, 6 ref.

Descriptors: *Analytical techniques, *Sulfates, *Water analysis, Gravimetric analysis, Economics, *Pollutant identification, Methodolo-

Identifiers: *Methylthymol blue method, Precision analysis.

The present standard sulfate method for water and waste water analysis is the gravimetric method. However, this method is tedious and time consuming. A faster Methylthymol Blue technique has

IMU

tested to be satisfactory. A comparative study of the two methods is presented. Both methods were evaluated by finding the differences between duplicate analyses for samples of 'waters' (clear samples from water supplies), 'rivers' (natural sur-face waters), and 'sewage' (raw inputs from domestic treatment plants as well as final effluents from both municipal and industrial sources) containing sulfate in a 0-50 mg/liter and a 0-200 mg/liter range. For precision, sensitivity, and number of interferences, the automated Methylthymol Blue method was analytically superior to the gravimetric method. It was also economically advantageous, having lower costs per analysis, a greater analysis speed, and smaller bench space requirements for performing the analysis. (Kramer-FIRL)
W75-12324

LIGHT AND ASSIMILATION NUMBER IN A SMALL DESERT, RECHARGED-GROUND-

Arizona State Univ., Tempe. Dept. of Zoology.

J. M. Foster, and B. I. Sherwood. Oecologia, Vol 18, No 2, p 155-194, 1975. 4 fig, 1

Descriptors: *Groundwater, *Recharge, *Water reuse, Analytical techniques, Monitoring, Chlorophyll, Photosynthesis, Carbon, Lakes, Eutrophication, Arizona, *Pollutant identification. Identifiers: Phoenix(Ariz), Physico-chemical stu-

dies, Biological analysis.

A study was made to evaluate the potential of water reclamation as a solution to water pollution and water storage problems. Physico-chemical and biological studies of recharged-groundwater at the Flushing Meadows Infiltration basins in Phoenix. Arizona, have been carried out, where part of the reclaimed waste water is stored in small artificial ponds. One desert pond (West Pond) was monitored for irradiance, chlorophyll a concentration, respiration, and net and gross photosynthesis. Over a six-month period, chlorophyll a concentration averaged 119 mg/cu m. Gross primary productivity in terms of mean daily carbon fixation rate was 8.29 C/cu m, which is less than many polluted eutrophic lakes and streams and is roughly equivalent to productive fish and farm ponds. A maximum value of gross assimilation number at 0.16 cal/sq cm/min of 30 mg C/hr per ml chlorophyll a indicate that this pond has a lent photosynthetic capacity. (Prague-FIRL) W75-12326

ENVIRONMENTAL WATER QUALITY PRO-GRAM.

Chicago Dept. of Aviation, Ill. For primary bibliographic entry see Field 5G. W75-12331

RECENT DEVELOPMENTS OF INSTRUMEN-TATION, CONTROL AND AUTOMATION SYSTEMS FOR WASTEWATER TREATMENT SYSTEMS,

Tokyo (Japan). Sewerage Bureau. For primary bibliographic entry see Field 5D. W75-12341

ORGANIC RESIDUE IN A RECYCLED EF-

FLUENT, PART I, Utah State Univ., Logan. For primary bibliographic entry see Field 5D. W75-12348

DETERMINATION OF NTA IN ENVIRONMEN-TAL WATER BY GAS CHROMATOGRAPHY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.

R. J. Stolzberg, and D. N. Hume. Anal Lett, Vol 6, No 9, p 829-837, 1973.

Descriptors: *Pollutant identification, *Gas chro-Analytical matography. techniques. *Nitrilotriacetic acid, Organic acids, Biodegradation, Water pollution sources.

Identifiers: Acetate, Amino, Anions, Bacterial, Biological, Carboxylate, Cation, Chelating, Chromatography, Degradation, Detergent, Determination, Environmental Esters, Growth, Interference, Laundry, Media, Methylsilyl, Nitrilo, Poly, Replacement, River, Spiked, Tri, USA, Water.

A rapid, sensitive gas chromatographic method for the determination of NTA (nitrilo-triacetate) as its trimethylsilyl ester was developed. The method is not subject to interference by common cations, a wide variety of anions, or other aminopolycarboxylate chelating agents. Satisfactory determinations of NTA in the low ppm range were carried out in artificial standards, spiked river water and bacterial growth media. The method is suitable for fol-lowing biological degradation of NTA which has been suggested as partial replacement for phosphates in laundry detergents in the USA.— Copyright 1974, Biological Abstracts, Inc. W75-12363

DETERMINATION OF RESIDUAL QUANTITIES OF THE BUTYL ESTER OF 2,4DICHLOROPHENOXYACETIC ACID IN ENVIRONMENTAL OBJECTS BY GAS-LIQUID
CHROMATOGRAPHY, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Giirisi i Telebelarii Destiridov (Issue (USS)) gieni i Toksikologii Pestitsidov, Kiev (USSR).

R. D. Vasyagina, and V. D. Chmil'. Gig Sanit., Vol 38, No 5, p 69-72, 1973.

Descriptors: *Pollutant identification, *Gas chro-matography, *Organic acids, *Pesticides residues, Standards, Chromatography, Water quality stan-dards, Analytical techniques. Identifiers: Esters, Gas-liquid chromatography.

Quantitative methods were developed for determining residual quantities of the vapors of the butyl ester of 2,4-D in air (sensitivity 0.3 ug/1) and of this butyl ester in water (sensentivity 10 ug/1) by means of gas-liquid chromatography. There is no need for a quantitative analysis if an internal standard having similar physiocochemical properties to the pesticides being analyzed is added to the sample before extraction. In the given case the methyl ester of 2,4,5-trichlorophenoxyacetic acid was used as the internal standard.—Copyright (c) 1974, Biological Abstracts, Inc. W75-12393

WATER-QUALITY DATA. ANCHORAGE AND VICINITY, ALASKA, Geological Survey, Anchorage, Alaska. D. E. Donaldson, P. J. Still, and C. Zenone. Open-file report, 1975. 59 p, 1 fig, 1 plate, 10 tab,

Descriptors: *Basic data collections, *Water quali-ty, *Surface waters, *Groundwater, *Alaska, Chemical analysis, Inorganic compounds Biochemistry, Physical properties, Streamflow, Sediment transport, Sediment yield, Particle size, Sempline, Stree Mo. Sampling, Sites, Maps. Identifiers: *Anchorage(Alaska).

This compilation of selected water-quality data was collected in Anchorage and vicinity, Alaska, between 1948 and 1973. The surface and grounddata include concentration of individual constituents, as well as certain properties or characteristics such as hardness, specific conductance, pH, temperature, and color. Fluvial-sediment data include suspended-sediment con-centration, suspended-sediment discharge, and particle-size distribution of suspended sediment. In 1973, wells were drilled within and adjacent to the Greater Anchorage Area Borough's landfill (solid-waste disposal site) near the Anchorage International Airport and at a landfill on Elmendorf Air Force Base to determine the presence and

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution-Group 5B

chemical characteristics of any leachate produced by the landfills. Water-quality data from the wells are included in tables. (Woodard-USGS)

5B. Sources Of Pollution

RELATIVE THROUGHFALL ENRICHMENT BY BIOLOGIC AND BY AEROSOL-DERIVED MATERIALS IN LOBLOLLY PINES,

Mississippi Univ., University. Dept. of Geology and Geological Engineering.

K. J. Banaszak.

Available from the National Techincal Information Service, Springfield, Va 22161, as PB-245 258, \$3.75 in paper copy, \$2.25 in microfiche. Mississip-pi Water Resources Research Institute, Mississippi State, Completion Report, August 1975. 28 p, 3 fig. 1 tab. 13 ref. OWRT A-083-MISS (1).

Descriptors: *Throughfall, *Nutrients, Rain, *Aerosols, *Loblolly pine trees, Coniferous trees, Silica, Phosphates, Ammonia, Sulfates, Nitrates, Alkalinity, Potassium, Hydrogen ion concentration. Sodium, Calcium.

The objective was to provide an estimate of the relative importance of nutrient enrichment from two sources, biologic materials and aerosols, associated with rain falling through a pine canopy. A plot of loblolly pines was divided into one half that was left as it was and the other half that was en-closed in an attempt to isolate it from aerosols. Rain water and water from the throughfall and stemflow of the trees were analyzed for silica, phosphate, ammonium, sulfate, nitrate, pH, alkalinity, potassium, sodium, and calcium. It appears that there is little difference in enrichment factors from the enclosed versus the open trees. e contribution of aerosol material to the dissolved load of throughfall is minimal. There also appears to be no net loss of constituents from the canopy of young, growing loblolly pines in very dense stands except for potassium.

A COMPARISON OF THE METHODS USED TO CALCULATE FIRST ORDER BOD EQUATION CONSTANTS,

CUNSTANTS, Rutgers - the State Univ., New Brunswick, N. J. Dept. of Environmental Science. J. P. Hewitt, and J. V. Hunter. Water Research, Vol. 9, No.7, p 683-687, 1975. 8 tab, 12 ref. OWRT A-0250-NJ (6). 14-31-0001-3830.

Descriptors: *Biochemical oxygen demand, Oxygen demand, Water quality, Water pollution effects, Kinetics, Methodology, Equations.
Identifiers: *BOD rate constants, First order

A comparison of seven published methods for cal-culating first order BOD equation constants for river water samples showed that six of the methods gave k values that varied up to 57% from those obtained using the reference Reed-Theriault procedure. Variations of Lo values from those of the reference method were as high as 51%. In addition certain methods tended to give higher k and/or LO values and others to give low k and/or Lo values. The cause of these deviations was not deficiencies in the calculation methods but probably poor adherence to first order kinetics. W75-11855

THE USE OF A SPECIALIZED DRILLING AND THE USE OF A SPECIALIZED DRILLING AND
GROUND WATER SAMPLING TECHNIQUE
FOR DELINEATION OF HEXAVALENT
CHROMIUM CONTAMINATION IN AN UNCONFINED AQUIFER, SOUTHERN NEW JERSEY COASTAL PLAIN,

Woodward-CLyde Consultants, Clifton, N.J. For primary bibliographic entry see Field 5A. W75-11899

THE EFFECT OF WIND ON THE SPREAD OF CONTAMINATION IN THE YEISK ESTUARY.

(IN RUSSIAN),
V. A. Prokopenko, O. L. Davydov, O. V.
Mezhera, and Y. M. Khabakhbashev.
Gig Sanit, Vol 3, p 101-103, 1974.

Descriptors: *Estuaries, Water pollution, Soil contamination, *Winds, Beaches, *Sewage effluents, Sea water, Analysis, *Water pollution sources, *Path of pollutants. Identifiers: *Yeisk(RFSFR), USSR.

The influence of wind on the effect of sewage discharge on water usage areas, such as beaches, in the Yeisk estuary and the city of Yeisk (Russian SFSR, USSR) was investigated during 1967-1970. During the summer, the city was inhabited by 70,000-75,000 people. The sewage was discharged into the Yeisk estuary. The mean yearly wind velocity in Yeisk was 6.1 m/s. Pollution reached the beach areas in 4 h. The chemical and bacteriological quality of the sea water in the sewage discharge area was studied. East and northeast winds led to pollution of the mouth of the estuary West and southwest winds favored pollution of the beach areas between Yeisk and Shirochanka. The intensity of the dilution process with increasing wind strength increased only in the areas nearest to the sewage outlet.--Copyright 1975, Biological Abstracts, Inc. W75-11983

ENVIRONMENTAL RESEARCH LABORATORIES, 1973 ANNUAL REPORT.

National Oceanic and Atmospheric Administra-tion, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab. For primary bibliographic entry see Field 5A. W75-12033

DISTRIBUTION OF SOLAR RADIATION WITHIN A DECIDUOUS FOREST,

National Oceanic and Atmospheric Administra-tion, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab. For primary bibliographic entry see Field 21. W75-12034

A NOTE ON THE ELEVATION OF THE MEAN AND THE MODE OF THE GAUSSIAN CON-CENTRATION DISTRIBUTION,

CENTRATION DISTRIBUTION, National Oceanic and Atmospheric Administra-tion, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab. For primary bibliographic entry see Field 5A. W75-12035

APPLICATION OF A SIMPLE DISPERSION MODEL TO A RURAL INDUSTRIAL REGION, National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab. For primary bibliographic entry see Field 5A. W75-12037

THE SIMPLE ATDL URBAN AIR POLLUTION

MODEL, National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab. For primary bibliographic entry see Field 5A. W75-12038

DISPERSION AND SETTLING AROUND A WASTE DISPOSAL POINT IN A SHALLOW SEA.

Liege Univ. (Belgium). Institut de Mathematique. J. C. J. Nihoul, and Y. Adam. Journal of Hydraulic Research, Vol 13, No 2, p 171-186, 1975. 5 fig, 5 ref.

Descriptors: *Waste disposal, *Tidal effects, *Mathematical models, *Turbidity, *Diffusion, Shear, Sediment transport, Dispersion, Data collections, Estuaries, Numerical analysis, Fluid mechanics, Shallow water, Sea water, Tides, Water pollution sources, *Path of pollutants. Identifiers: *Belgian coast, Tidal cycle.

Waste disposal into the sea gives rise to pollution problems associated with local increases in tur-bidity and the deposit of sediment on the sea bed. Turbidity reduces depth of penetration of sunlight and hence the chlorophyll synthesis intensity. The diffusion mechanism in shallow seas is essentially two-dimensional, and estuary diffusion models have to be generalized to make allowance for the rotation of the earth. Equations were derived that govern the horizontal dispersion of a poliutant in the sea under the influence of the two-dimensional shear effect on settling and removal of sediment from the bottom during the part of the tidal cycle when bed shear stress exceeds the critical value. It was shown that the shear effect gives rise to anisotropic dispersion. A numerical method of solution was developed and applied to actual dumping of wastes off the Belgian coast. Tidal currents predominated in the example area. The results obtained were in agreement with observations made in the course of dump supervision operations. (Singh-ISWS)
W75-12043

VERTICAL TEMPERATURE PROFILES IN OPEN-CHANNEL FLOW,

Dar es Salaam Univ. (Tanzania). E. J. Schiller, and W. W. Sayre. Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY6, Paper 11389, p 749-761, June 1975. 7 fig, 16 ref, 2 append. OWRT C-3140(3692)(2). NSF GK-

Descriptors: *Dispersion, *Thermal stratification, *Water pollution, *Open channels, Hydraulics, Stratified flow, Thermal pollution, Temperature, Open channel flow, Mixing, Heat transfer, Buoyancy, Turbulent flow, Distribution, Profiles. Identifiers: Bulk mixing coefficient.

Methods were presented for predicting vertical mixing of heated surface effluents in the far-field mixing region. A set of laboratory flume experiments covered a range of flows from well-mixed to nearly stably stratified conditions, over a range of conditions commonly encountered in practice. The data, together with analysis based on the convec-tion-diffusion equation, were used to determine: (1) the distance for nearly complete mixing; (2) a bulk mixing coefficient. K sub y, for rapidly mix-ing flows; and (3) the vertical distribution of the overall vertical heat transfer coefficient, E sub Ty, at downstream cross sections. Buovancy effects were reflected in the vertical distribution of E sub Ty. Stratification sharply inhibited vertical mixing near the surface and reduced vertical mixing throughout most of the depth. For rapidly mixing flows, the vertical heat transfer coefficient agreed closely with the turbulent mass and momentum transfer coefficient. (Lee-ISWS) W75-12047

GEOCHEMISTRY OF STRONTIUM IN THE SCIOTO RIVER DRAINAGE BASIN, OHIO, Miami Univ., Oxford, Ohio. Dept. of Geology. For primary bibliographic entry see Field 2K. W75-12052

POLLUTION EFFECTS ON SURFACE WATERS AND GROUNDWATERS, (LITERATURE REVIEW), Hawaii Univ., Honolulu. Dept. of Civil Engineer-

R. H. F. Young.

Journal Water Pollution Control Federaton, Vol. 47, No. 6, p 1600-1610, June, 1975. 95 ref.

Group 5B-Sources Of Pollution

Descriptors: *Water pollution, *Reviews, *Groundwater, *Surface water, *Water pollution sources, *Water pollution effects, Water pollution control, Nutrients, Phosphorus, Nitrogen, Heavy metals, Phenolics, Organic compounds, Urban ru-noff, Model studies, *Toxicity, Aquatic organisms, Thermal pollution, Pesticides, Radioactive wastes, Bibliographies. Identifiers: Non-point sources

The 1973-74 literature dealing with the pollution of surface and groundwaters was reviewed. Topics covered included: nutrients in surface waters; runoff and waste discharges; groundwater pollution; land and subsurface disposal of waste water; heavy metals; radionuclides; biological contamination; thermal discharges; and models and indexes of water quality. Phosphorus and nitrogen studies were performed with regard to levels, relationship to productivity, sources, and control. Carbon chloroform extract, phenol, DDT, PCB, heavy metals, soil and grease, and coliforms are constituents of runoff and waste discharge. The toxicity of chlorine residuals to aquatic organisms was investigated. Hydrocarbons in sediments and the environmental effects of outboard motor subsurface exhausts were reported. Urban runoff and non-noint sources received more attention than in previous years. Causes, effects, controls, and monitoring of groundwater pollution are discussed. Sources and toxic effects of heavy metals are reported. Orr-FIRL W75-12070

ORGANICS, (LITERATURE REVIEW), Drexel Univ., Philadelphia, Pa. Dept. of Environ-mental Engineering and Science. I. H. Suffet, S. Friant, C. Marcinkiewicz, M. J. McGuire, and D. T-L. Wong. Journal Water Pollution Control Federation, Vol 47, No 6, p 1169-1241, June, 1975. 13 tab, 701 ref.

Descriptors: Water pollution, *Reviews, *Organic compounds, *Water pollution sources, Water pollution control, Pollutant identification, Pesticides, Oil pollution, Detergents, Surfactants, Water analysis, Plastics, Toxicity, Environmental effects, *Bibliographies.

An extensive review of the 1974 literature on organics in water pollution (identification, analytical procedures, treatments, sources) is presented. Topics covered included: oxygen demand and organic carbon; detergents and surfactants; oil and grease, pesticides and related chlorinated hydrocarbon compounds such as chlorinated hydrocarbon pesticides, polychlorinated biphen-yls, napthalenes and paraffins, organophosphorus pesticides, carbamates and ureas, herbicides, and other pesticides; and, organic analysis of water including waste water analyses, drinking water and natural water analyses, and analyses of humic acids, organic mercury compounds, plastics, plasticizers-phthalate acid esters, taste and odor compounds, organic acids, nitrogen compounds, nogenic compounds, and sulfur compounds The following information was presented in table form: toxicity and biological effect of detergents, surfactants, and detergent builders on aquatic or-ganisms; toxicity and biological effects of petroleum contaminants on aquatic organisms; toxic effects of chlorinated hydrocarbon biocides in aquatic organisms; residuals of chlorinated hydrocarbons in aquatic related organisms; residuals of chlorinated hydrocarbons in soils and sediments; photolysis studies of chlorinated hydrocarbons; toxic effects of PCB's on aquatic related organisms; summary of studies of environ-mental impact of pesticides; toxic effects of herbicides to aquatic related organisms; herbicide adsorption studies, photolysis studies of herbicides; collection methods for identification of trace organics in water; and, toxicological levels and effects of mercury. (Orr-FIRL) W75-12071

INORGANICS, (LITERATURE REVIEW), Tennessee Univ., Knoxville. Dept. of Civil Engineering. For primary bibliographic entry see Field 5A. W75-12072

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL. VOLUME

VTN, Inc., Orlando, Fla. For primary bibliographic entry see Field 5E. W75-12111

EFFECTS OF AERIAL FOREST FERTILIZATION WITH UREA PELLETS ON NITROGEN LEVELS IN A MOUNTAIN STREAM, Pacific Northwest Water Lab., Corvallis, Oreg. K. W. Malueg, C. F. Powers, and D. F. Krawczyk. Northwest Sci., Vol 46, No. 1, p 52-58. 1972.

Descriptors: *Forests, *Fertilization, *Ureas, *Nitrogen, Streams, Rainfall, Water pollution effects, *Path of pollutants. Identifiers: Aerial fertilization, Mountain streams,

Effects of urea pellets introduced directly into the water during the application were considered, in addition to wash-off and leaching from the adjacent forest land. Aerial application of fertilizer resulted in rapidly increased urea concentration in the water, and this was probably due to direct fallout into the water. Fertilization of the watershed immediately adjacent to the stream resulted in movement of N to the water during periods of rainfall.--Copyright (c) 1973, Biological Abstracts, Inc. W75-12113

POLLUTION OF GROUNDWATER DUE TO MUNICIPAL DUMPS, Department of the Environme (Ontario). Inland Waters Directorate. Environment, Ottawa

G. Hughes, J. J. Tremblay, H. Anger, and J. Water and Pollution Control, Vol 110, No 1, p 15-17, 1972

Descriptors: *Groundwater, *Water pollution control, *Landfills, *Leachate, Garbage dumps, Gases, Regulation, Precipitation(Atmospheric), Hydrology, Surface waters, Methane, Carbon Hydrology, Surface waters, M dioxide, *Water pollution sources.

Major investigations of the production and movement of dissolved solids and gases from solid waste disposal sites have been made in California and Great Britain. Other investigations have been conducted in New York, Illinois, Pennsylvania, South Dakota, West Virginia and Wisconsin. The studies revealed that a polluting leachate can be produced by refuse in contact with water, either groundwater or surface precipitation. In Britain, Illinois, and Wisconsin, investigations have demonstrated that precipitation will infiltrate refuse to produce a leachate unless measures are taken to seal the complete landfill surface Methane and carbon dioxide, as well as dissolved solids, are produced by the refuse decomposition; the former may create explosion problems and carbon dioxide may increase groundwater hardness. The design of protective measures for otherwise unsuitable sites appears feasible and is being studied in California and Illinois. Currently regulathat certain physical conditions exist at the site to prevent pollution which may be unduly restrictive or hopelessly complex. The effectiveness of vari-ous types of liners, mechanisms by which con-taminants are removed from leachate by natural processes, effects of slope, materials, and vegeta-tion on infiltration into a landfill, and methods of leachate treatment require investigation. (Auen-Wisconsin)

NITROGEN TRANSFORMATION AND UP-TAKE.

Guelph Univ. (Ontario) . Dept. of Land Resource Science.
E. G. Beauchamp, and J. Moyer.

In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 159-173. (1974) 9 fig,

Descriptors: *Sludge disposal, *Fertilization, *Nitrogen cycle, *Crop response, Nitrification, Denitrification, Nitrogen fixation, Leaching, Groundwater, Surface waters, Absorption. Identifiers: Land application.

Some of the more important transformations of sludge nitrogen and their importance to crops and the environment are discussed. Nitrogen is one of the limiting factors in the disposal of sewage sludges on argicultural land. The total organic N content of anaerobically digested sludges may vary between 0.1 and 0.3 on a fluid basis. The ammonium nitrogen (NH4-N) content may be between 2 and 50% of the total N. Transformations discussed include: mineralization of organic N; conversion of NH4 to NO3 via nitrification; volatilization of NH3; immobilization of organic N, NH4, and NO3 by soil microorganisms; NH4 fixation in clays; and, denitrification of NO3. The nitrification process involving the conversion of NH4 to NO3 is the most important from the point of view of crop uptake and ground or surface drainage water pollution. Sludge should not be applied in quantities which supply more available N (NH4) than the crop requires. This will prevent NO3 pollution of ground and drainage waters as well as an excessive uptake of NO3-N by plants which could be harmful to ruminants. (See also W75-11715) (Orr-FIRL) W75-12136

RUNOFF AND EROSION LOSSES,

W. E. Curnoe.

In: Sludge Handling and Disposal Seminar, Con-ference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 174-184. (1974) 6 tab,

Descriptors: Runoff, Erosion, Sludge, Clay loam, Nutrients, Heation(Atmospheric). Heavy metals, Precipita-Identifiers: Soil conditions. Experiments.

Experiments were conducted to determine nutrient and heavy metal losses through runoff and erosion. The experiments began in the fall of 1972 and were conducted through the spring of 1974. The soil was a sandy clay loam with tile drains on a 2% and 6% slope. The sludge was applied in November, January, and May. Water was collected and measured and samples were taken for analysis after each runoff. Precipitation pat-terns and runoff events are directly related. The experimental period had a precipitation rate slightly above average. The highest nitrogen loss occurred during the winter months. The sludge ap-plication time did not seem to affect the phosphorus loss which was low. Heavy metal losses were also generally low. The conclusions were: before applying sludge, weather probabilities, snow cover, and soil conditions should be considered; application rates can increase nutrient runoff and should be restricted; and the amount of metal in the sludge has an effect on the amount of heavy metal loss. (See also W75-11715) (Dean-FIRL) W75-12137

SOME MICROBIOLOGICAL ASPECTS OF THE LAND DISPOSAL OF SLUDGE, Guelph Univ. (Ontario). Dept. of Microbiology. For primary bibliographic entry see Field 5D.

CATION DISTRIBUTION IN SOILS AS RE-LATED TO SEWAGE SLUDGE DISPOSAL ON LAND.

Guelph Univ. (Ontario). Dept. of Land Resource Science

R. Protz. In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 192-206. (1974) 15 fig,

Descriptors: *Sludge disposal, *Fertilization, *Soil science, *Cations, *Soil profiles, Soil horizons, Soil moisture, Soil physical properties, Soil structure, Path of pollutants

Research being conducted at the University of Guelph, Ontario on the land disposal of sewage sludge includes a study to demonstrate variation of soils at the macro (field plot) and micro (cation) scales. This type of data will be included in the development of final guidelines for soil sampling and analyses. Clay content influences the pH and variability of CaCO3 content by influencing the amount of water passing through the soil. The amount of water passing through the son. The potential maximum variability of cations in a soil is demonstrated with two profiles 12 inches apart in coarse textured soils. This variability is caused by the inherent fluvial parent material and the influence of trees on soil formation. Distribution of cations within the soil profile is under the ultimate control of their solubility products, porosity of the soil, and the micro variations in the soil moisture regime. The "final" distributions of cations within the soil on the microscopic scale are illustrated by micrographs of the different pedological precipitates and concretions found in soils. In order to dispose of waste on agricultural land for food production under environmentally safe conditions, it is necessary to understand the variability of cations in soils to accurately monitor the system. (See also W75-11715) (Orr-FIRL) W75-12139

MINE DRAINAGE ABSTRACTS, A BIBLIOG-RAPHY. 1972 SUPPLEMENT.

Bituminous Coal Research, Inc., Monroeville, Pa. Pennsylvania Dept. of Environmental Resources, Harrisburg, (1973), 72 p. 103 ref.

Descriptors: "Mine drainage, "Abstracts, "Bibliographies, Waste treatment, Water pollution control, Abatement, Analytical techniques, Water pollution sources, Pollutants, Water pollution ef-fects, Economics, Legal aspects, Waste disposal, Pennsylvania, Alabama, Missouri, West Virginia, Virginia, Kentucky, Indiana, Illinois, Montana, Foreign countries.

Identifiers: Denmark, Japan, Germany, United Kingdom.

This 1972 supplement contains 103 abstracts of all publications and reports added to the Coal Mine Drainage Library at the Bituminous Coal Research, Inc., during that year and was prepared for the Pennsylvania Department of Environmental Resources. It excludes, however, abstracts relating to surface strip mining and reclamation. The 'Subject Classification Index' lists pollution sources, pollutant material, quality and analysis, abatement procedures, and legal, economic, geological and hydrological considerations. The 'Geographical Index' lists Denmark, the Federal Republic of Germany, Japan, United Kingdom, and lakes in Pennsylvania, Ohio, and Missouri; and takes in Pennsylvania, Onlo, and Missouri, mine discharges in Pennsylvania; rivers and streams in Pennsylvania, Alabama, Missouri, West Virginia, Ohio, Virginia, Kentucky, Indiana, Illinois, Montana; and strip-mined lands in Ken-tucky, Pennsylvania, and West Virginia. Other indices list the authors and their affiliations. (Auen-Wisconsin) W75-12158

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL

BACKGROUND: PHYSICAL OCEANOG. RAPHY, GEOLOGICAL OCEANOGRAPHY. AND CHEMICAL OCEANOGRAPHY.

National Oceanic and Atmospheric Administra-tion, Miami, Fla. Atlantic Oceanographic and Meteorological Labs

Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, as C55.13:ERL 332-MESA 3. NOAA TR ERL 332-MESA-3, April 1975, 83 p.

Descriptors: *Marine geology, *Sewage sludge, *Sludge disposals, *Wastes, Water circulation, Oceanography, Ocean circulation, Ocean currents, Tides, Bays, Sludge, Solid wastes, Sediments, Sediment discharge, Sedimentation, Water sampling, New York. Identifiers: *Offshore dumping, *New York Bight, Physical oceanography, Geological oceanography, Chemical oceanography, Bottom sediments, Tidal currents, Nutrient distributions, Bight wastes, Bight waters

Bight wastes, Bight waters.

This report deals with the offshore dumping in the New York Bight, primarily its physical, geological, and chemical oceanographic effects. Physically, the analysis shows two distinct circulation regimes. (1) near the harbor mouth and along the New Jersey coast, New York Harbor discharge flows southward parallel to the New Jersey coast; at depth, there is a return flow of external water into the estuary. (2) Outside the region of strongest influence from river discharge, a persistent clockwise circulation or eddy appears to exist. Geologically, fine-grained waste dumped in New York Bight is entrained in a clockwise circulation pat-tern and is dispersed to the north. A significant portion is deposited in the low area (Christiaensen Basin) immediately northwest of the dumpsites. Chemically, the data from water sampling show that nutrient (nitrates, silicates, and phosphates) distributions are dominated by the lower New York Bay outflow, with dumped sewage sludge contributing very small amounts. Bottom grab samples were analyzed for total organic carbon and total carbohydrates. (NOAA) W75-12171

OCEAN DUMPING IN THE NEW YORK BIGHT.

National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.

Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, as C55.13: ERL 321-MESA 2. NOAA Technical Report ERL 321 - MESA 2, March 1975. 78 p, 40 fig, 5 tab, 117 ref.

Descriptors: *Sewage sludge, *Sewage disposal, *Waste disposal, *Water pollution, *Water pollution effects, Wastes, Disposal, Sewage, Industrial wastes, Aquatic environment, Path of pollutants, Marine geology, Ocean circulation, New York,

Identifiers: *Ocean dumping, *New York Bight, Sewage dumping, "Dumping, "New York Bight,
Sewage dumping, "Dumping, Dredge spoils,
Waste acid, Cellar dirt, Oceanographic studies,
Geological oceanography, Physical oceanography,
Chemical oceanography, Biological oceanography,
Dump ites, Marine environment, Fish polluting, Fin-root disease.

The New York Bight extends seaward over 15,000 square miles from Long Island and New Jersey to the edge of the continental shelf, some 80-100 nautical miles offshore. Wastes from 20 million people are discharged to the Bight. These wastes arrive by a variety of routes: ocean dumping, outfall sewers, air pollution, river discharge, land runoff, thermal discharges, vessel wastes, and occasional spills.

Although impacts of these wastes on the marine environment are not clearly understood, there is evidence that the waters, bottom sediment, and living resources are under stress. In 1973 the amount of raw and digested sewage sludge was 150 million ft 3 (4.3 x 106 m3). An average of 260 million ft3 (7.4 x 106 m3) per year of dredge spoils were dumped each year between 1965 and 1970, as well as waste acid, and construction and demoli-tion debris. The hazards of this dumping are not known, however above normal incidence of fin-rot disease in fish in the area and the closing of the area to shellfishing are indictions that something is wrong. However, there is no evidence of massive shoreward movement of the sludge, or of imminent bacteriological hazard to the beaches. It is recommended that land-based disposal alterna-tives be developed. (NOAA)

REPORT TO THE CONGRESS ON OCEAN DUMPING RESEARCH, JANUARY THROUGH DECEMBER 1974 PUBLIC LAW 92-532, TITLE II. SECTION 201.

National Oceanic and Atmospheric Administration, Washington, D.C.

Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 for \$1.10. June 1975. 48 p, 6 fig, 1 tab, 27 ref

Descriptors: *Oceans, *Sewage sludge, *Water pollution, *Water pollution effects, *Water pollution treatment, *Waste disposal, Wastes, Disposal, Waste treatment, Dredging, Waster law, Dredging, Sewage, Industrial wastes, Aquatic environment, Pollutants, Marine geology, Path of pollutants

Identifiers: *Ocean dumping, Sewage dumping, New York Bight, Waste materials, Dredged materials, Nondredged materials, Geological oceanography, Physical oceanography, Chemical oceanography, Biological oceanography, Dump sites, Ocean disposal.

This is the second annual report submitted to Congress on the federally sponsored research on the effects of ocean dumping, as required under Section 201. The report describes significant Federal research programs and activities carried out in 1974. It also includes a summary of 1974 studies relative to the requirements of Section 203. It con tains sections on research on ocean disposal of dredged and nondredged material, dumpsite characterizations, Coast Guard R and G for ocean dumping surveillance and enforcement, dredged material disposal in the Great Lakes, and research on alternatives to ocean dumping. During 1974 approximately 130 million tons of material were dumped in U.S. coastal waters. Dredged material accounted for 118 million tons, or over 90% of the total tonnage dumped in 1974. This amount was twice the dredged material deposited in the ocean in 1973. The increase was due to extensive flood-ing and silting in the Mississippi River basin in recent years. Dredged material is an environmental concern because of the large quantities in-volved and the presence of contaminated sediments. The ocean disposal of wastes other than dredged materials occurs mainly in the New York Bight. (ETJA) W75-12173

THE MUSSEL WATCH-A FIRST STEP IN GLOBAL MARINE MONITORING, Scripps Institution of Oceanography, La Jolla,

E. D. Goldberg.

Marine Pollution Bulletin, Vol 6, No 7, p 111, July 1975, 5 ref.

*Mussels, *Bioindicators, Oceans, Coasts, Water Pollution Sources, Pollutant Identification, Heavy Metals, Halogenated pesticides, Oil, Laboratory studies, Economics, Pollutant identification. Identifiers: Transuranics, Bioaccumulation.

world mussel watch (using e.g. Mytilus edulis) of specimens from 100 coastal and open ocean sites was suggested. Mussels, which are especially

Group 5B-Sources Of Pollution

suitable for measuring pollutant levels, would be analyzed for their concentrations of halogenated hydrocarbons, transuranics, heavy metals and petroleum. This project wa economically reasonable. (Katz) was presented W75-12187

ACTIVITY OF ENZYMES (PROTEASE AND UREASE) AND FORMS OF MOBILE NTROGEN IN THIN PEAT SOIL OF THE SECOND YEAR OF USE, (IN RUSSIAN), Akademiya Navuk BSSR, Minsk. Inst. of Experi-

T. A. Shcharbakova, H. Ya. Korabava, and S. M. Ramdz'ka

Vyestsi Akad Navuk B SSR syer Biyal Navuk, No 1, p 47-54, 1973.

Descriptors: *Enzymes, *Nitrogen, *Peat, Potatoes, Soils, Crop production, Grasses, Mineralogy, Hay, Water pollution sources, *Path of pollutants Identifiers: Mineralization, *Protease, *Urease.

The thin peat soil with a groundwater level at a depth of 80-120 cm displayed a high urease and proteolytic activity. The appreciable accumulation of mobile N substances produced high yields of potatoes and hay of perennial grasses. Ammonia N was the predominant form of mobile N. In most cases a direct correlation was observed between urease activity and total content of mobile N. Mineralization processes of the organic N-containing substances in the peat soil occurred more intensely during cultivation of potatoes in comparison with perennial grasses. The activity of enzymes and accumulation of mobile N substances in the drained bog were at a level close to cultivated soils .- Copyright 1974, Biological Abstracts. Inc.

SALT RECOVERY SYSTEM,

W75-12216

B. Keilin and J. M. Hebert US Patent No 3,899,421, 8 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 631-632, August 12, 1975.

Descriptors: *Patents, *Water softening, *Water quality treatment, *Water pollution treatment, *Water pollution sources, *Water pollution control, Cleaning, Equipment, Recycling. Identifiers: Backwash.

During a resin regeneration cycle of water softeners the effluents are sent to the sewer with the result that not only does a considerable amount of salt go to waste but also the salt adds to the pollution in the waste water. In this invention the recovery of salt is accomplished by selectively bleeding off the high salt content portion of the effluent passing through the drain line of an automatic water softener and collecting it for reuse or selective disposal, while permitting those portions of the effluent stream containing little or no salt to pass to waste. The salt recovery system includes sensing means for the detection of high salt concentration in the effluent stream passing a given point adapted to actuate a diverter valve in the drain line to shunt the flow of effluent through a downpipe and into a collecting tank. This is ac-complished by means of circuitry containing a conductivity cell, a relay and a solenoid. The collecting tank for the diverted salt solution is an evaporator tank fitted with a float-actuated immersion heater. When the liquid in the tank reaches a predetermined level, it moves a float into position to close the heater circuit and an immersed heater element comes on to heat the liquid. (Sinha-OEIS)

THE IMPACT OF CHEMICAL POLLUTION ON WATER UTILIZATIONNUTZUNG)...

MI

(CHEMISCHE GEWAESSERVERUN-REINIGUNG UND WASSER

Karlsruhe Univ. (West Germany). Carl Engler-und Hans-Bunte-Institut fuer Mineraloel-und Kohleforschung.

H. Sontheimer. Schweizerische Zeitschrift fuer Hydrologie, Vol 37, No 1, p 118-134, June, 1975. 9 fig, 3 tab, 12 ref.

Descriptors: *Water quality control, *Analytical techniques, *Water pollution sources, *Industrial wastes, *Organic compounds, Chemical oxygen demand, Chemical analysis, Biological treatment, Waste discharge, Waste water treatment.
Identifiers: *Rhine River. Physico-chemical treat-

ment, Refractory compounds.

Potable water from natural reservoirs is threatened by pollution by synthetic chemicals. The Rhine river is described; its lower reach is enriched with refractory organic compounds which are the result of self-purification of industrial pollution from the upper part of the river. Changes in water composition are detected by various analytical methods, such as the quantitative determination of individual substances or groups of sub-stances. In addition, methods have been applied which indicate the organic content by overall parameters such DOC, COD, or UV-extinction. Studies in the winter of 1971-1972 indicated that refractory compounds in industrial waste water should be eliminated by physico-chemical techniques in addition to the conventional biological treatment before discharge to the river. (Kramer-FIRL)

STUDIES OF PREVENTION OF WATER POL LUTION, III. ON THE BIODEGRADATION OF SYNTHETIC DETERGENTS, (IN JAPANESE), O. Sakaguchi, K. Yokota, and S. Takashita. Eisei Kagaku, (Jour of Hygienic Chemistry), Vol 21, No 2, p 51-54, 1975. 4 fig.

Descriptors: *Biodegradation, *Detergents, Alkylbenzene sulfonates, Water pollution, Sewage, Municipal wastes, Aerobic conditions, Anaerobic

The biodegradation of synthetic and commercial detergents has been examined at various condi-tions. Domestic sewage was incubated at 30 degrees, to study the degradation of linear alkyl benzenesulfonate (LAS) and alkyl benzenesulfonate (ABS). Twenty ppm LAS degraded easily and was about 50% consumed after seven days under aerobic conditions, but was only slightly degraded under anaerobic conditions. On the other hand, the higher fatty acid ABS was easily biodegraded under both aerobic and anaerobic conditions after one day. Biodegradation of LAS was delayed in the presence of nutrients. When de-tergent-grown cells separated from domestic sewage were observed, they showed two optimal peaks of 2.3.5-triphenyltetrazolium chloride (TTC) reduction activities at pH 7.0 and 8.5. (Kramer-FIRL) W75-12316

DETERMINATION OF NTA IN ENVIRONMEN-TAL WATER BY GAS CHROMATOGRAPHY. Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry. For primary bibliographic entry see Field 5A. W75-12363

5C. Effects Of Pollution

TOXICITY OF COPPER COMPLEXES TO RFRESHWATER MOLLUSKS,

RFRESHWALED STOCKED TO THE STOCKED AND ACTION AND ACTION OF THE STOCKED ACTION OF THE STOCKED AND ACTION OF THE STOCKED ACTION OF THE STOCKED ACTION OF THE STOCKED ACTION OF THE STOCKED ACTION OF THE

lation FSTC-HT-23-1987-72. March 1973. Translated from Prochvoved, Vol. 26, No. 2, 1971. 5 p.

Descriptors: *Mollusks, *Freshwater, *Copper, compounds, *Toxicity, *Copper compounds, *10xicity, *Spectrophotometry, Gastropods, Separation techniques, Antifouling materials, Aquatic environment, *Pollutant identification, Water pollu-

Identifiers: Copper pyridinates, *Copper com-plexes, Pyridine complexes, Alpha-beta-picoline, 2,6-lutidine, ligands.

The toxicity of some complex compounds of copper with pyridine and its homologues on freshwater mollusks was evaluated. The pyridine complexes evaluated were Alpha, Beta-picoline, and 2-.6-lutidine in concentrations of 0.01-5.0 mg Cu in one liter. Contents of copper in the water and in the organic mollusks was determined spec-trophotometrically using a SF-4a spectrophotome-ter with sodiumdiethyldithiocarbamate in the presence of a citrate-versene mixture at a pH of 8.0 with subsequent extraction of the stained complexes with carbon tetrachloride. Alpha-picolinecopper and 2,6-lutidine of copper exerted a less toxic effect than cupric chloride. The toxicity of dichloropyridinecopper and a complex of copper with Beta-picoline was higher in all experiments than the toxicity of CuC12 in the same concentrations. In concentrations less than 0.1 mg Cu in one liter, neither the copper complexes tested nor the CuC12 led to the death of bivalve mollusks tested 30 days. In all experiments pastropod mollusks were more resistant to the effects of the toxicants than bivalve mollusks. (Delfiner-Vanderbilt)

EFFECTS OF OILFIELD BRINE ON MARINE ORGANISMS, AN ECOLOGICAL EVALUA-TION OF THE ARANSAS BAY AREA. JOB NO.

Texas Parks and Wildlife Dept., Austin. T. L. Heffernan, J. Monier, and S. Page In: Coastal Fisheries Project Report 1971, p. 209-212. 6 ref.

Descriptors: *Crabs, *Shrimp, *Crustaceans, *Brines, Saline Water, Drilling Fluids, Lethal Limits, *Toxicity, Laboratory Tests, Water Quality, Chemical Analysis, Environmental Effects, Water pollution effects, *Texas.

Identifiers: *Brown Shrimp, *Blue Crabs, Penaeus aztecus, Callinectes sapidus, Sublethal Concentrations, LC-50, *Aransas Bay(Texas).

Toxicity studies were made of oilfield brine from two separator locations in conjunction with the Sinton oilfields: Haas' Ditch, emptying into Chiltipin Creek, and Southwestern Oil and Refinery emptying into Copano Bay. Salinity of this brine ranged from 82.4 to 91.6 parts per thousand. Mortalities were noted in all tests using brown shrimp (Penaeus aztecus), white shrimp (Penaeus setiferus), and juvenile blue crabs (Callinectes sapidus). Brine concentrations of above 40 per cent produced 100 per cent mortalities on all species tested. (Katz)

ACID MINE DRAINAGE IN CANE CREEK BASIN, NEAR OAKMAN, WALKER COUNTY, ALABAMA, Geological Survey of Alabama, University. For primary bibliographic entry see Field 5G. W75-11871

SEISMIC EXPLORATION: ITS NATURE AND SEISMIL BOX FISH,
EFFECT ON FISH,
Elcharies and Marine Service, Winnipeg

For primary bibliographic entry see Field 8G. W75-11877

STUDIES ON EFFECTS OF CERCARIAL CON-CENTRATION AND LENGTH OF EXPOSURE ON INFECTION OF MICE BY ST. LUCIAN SCHISTOSOMA MANSONI CERCARIAE IN A NATURAL RUNNING-WATER HABITAT, Saint Lucia Research and Control Dept., Castries. E. S. Upatham.

Parasitilogy, Vol 68, No 2, p 155-159, 1974. Identifiers: *Cercariae, Cercarial concentration,

Exposure, Habitat, *Human infection, Mice, Natural, Running, *Schistosoma-mansoni, St-Lucian(West-Indies), Water pollution effects.

The effects of cercarial concentration and length of exposure on the infection of mice by St. Lucian (West Indies) S. mansoni cercariae were investigated in a running-water habitat. For all exposure times, mice exposed to cercarial concentra-tions from 2.5-40 cercariae/mouse acquired no infections. At higher concentrations, infection rates and worm burdens of mice increased in direct proportion to cercarial concentrations and exposure times. The highest infection rate (57.9%) and worm burden (46 worms) were obtained in mice exposed for 256 min to 1280 cercariae/mouse. Cercarial concentrations are low in St. Lucian running waters, a fact suggesting that the risk of persons becoming infected while fording, collecting domestic water, washing clothes and swimming in habitats with reasonable flows is very low. Most infected individuals probably acquire a low worm burden over a rather long period of time.--Copyright 1974, Biological Abstracts, Inc. W75-11903

BEHAVIOURAL RESPONSES OF WHITEFISH AND RAINBOW TROUT TO DRILLING FLUIDS.

and Marine Service, Winnipeg **Fisheries** (Manitoba).

M. Lawrence, and E. Scherer.

Technical Report No 502, 1974, 47 p, 14 fig. 3 tab.

Descriptors: Biology, Pollution, *Environmental effects, *Drilling fluid, *Rainbow trout, Offshore platform, Sodium compounds, *Fish behavior, Ecology, Habitats, Persistence, *Water pollution

Identifiers: *Whitefish, Lignosulfates, Barite, Sodium hydroxide.

Behavioral responses of whitefish (Coregonus clupeaformis) and rainbow troup (Salmo gairdneri) to drilling mud (1 to 1000 ul/l) and its supernatant fraction (55 to 10,000 ul/l) were tested in laboratory experiments. Experiments were run under infrared as well as under visible light, to separate photically from chemically elicited responses. Four response parameters were recorded and analysed: (1) percent test time spent in pure compared to contaminated water, (2) effect of contact with contaminant on swimming speed, turning rate, and frequency of movements across the cen terline of the test chamber (boundary between pure and contaminated water), (3) extent of penetration by fish into pure vs contaminated water, (4) time spent at the end walls of the pure vs contaminated water side. Conclusions on preference or avoidance are derived from these behavioral elements. The results are discussed with regard to LC50 values of drilling fluids. Both whitefish and rainbow trout showed preference for mud suspensions at the maximum concentration tested, namely 1000 ul/l; this value represents 0.04 and 0.013 of the 96 hr LC50 for whitefish and rainbow, respectively. In tests with supernatant, both species showed a shift in their reaction from preference at 1000 ul/l toward avoidance at 10,000 ul/l. These two values equal 0.02 and 0.2 of a concentration still found to be non-lethal to whitefish in a static bioassay lasting 28 days. (Bradbeer-W75-11952

A COMPUTER PROGRAM USED TO ESTI-MATE PRIMARY PRODUCTIVITY FROM PH AND CARBON DIOXIDE DATA EMPLOYING THE UPSTREAM-DOWNSTREAM METHOD, Battelle-Pacific Northwest Labs., Wash.

E. G. Wolf, and R. J. Olson.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as BNWL-1828, \$4.25 in paper copy, \$2.25 in microfiche. BNWL-1828, May 1974. 24 p, 7 ref. AEC AT (45-

Descriptors: *Computer programs, *Primary productivity, *Streams, Hydrogen ion concentration, Carbon dioxide, On-site investigations, Estimating equations, Data collections, Upstream, Downstream, Respiration, Streamflow.

A computer program to estimate primary productivity was adapted using the upstream-downstream method and conversion of pH to carbon dioxide in lotic systems. The program was modified to in-clude multiple station sampling and interpolate readings that did not occur at hourly intervals. It utilizes mathematical equations fitted to carbon dioxide-pH conversion data. To apply the formula for estimating productivity to computer analysis, pH values were read in and converted to mil-limoles carbon dioxide; downstream pH values were offset by average flow time; accural correction was used to adjust upstream or downstream carbon dioxide values to account for any carbon dioxide addition to the area; millimoles carbon dioxide/1 were converted to grams carbon dioxide/sq meter; carbon dioxide values were cor-rected for diffusion and downstream carbon dioxwas subtracted from upstream values and divied by average flow time. This yielded positive values representing grams/hour community respiration and negative values representing grams/hour net productivity. The program integrates respiration and productivity values yielding daily values, average productivity, respiration per hour, integration of data annually, and total productivity of stream discharge volume per hour. The program was written for a UNIVAC 1108 computer using the FORTRAN level 5 language. (Buchanan-Davidson-Wisconsin) W75-11971

COMPARATIVE SURVIVAL OF ENTEROCOC-CI, COLIFORMS AND SALMONELLAS IN WATER, (IN RUSSIAN), Institute of General and Municipal Hygiene,

Moscow(USSR). G. G. Kalina.

Gig Sanit, Vol 5, p 102-104, Illus, 1974.

Descriptors: *E. coli, *Coliforms, *Salmonella, Rivers, *Streptococcus, Microorganisms, Enteric bacteria, Bioindicators, Mortality. Identifiers: Enterococci, Escherichia-coli, Escherichia-freundii, Fecal, Salmonella-typhinurium, Streptococcus-faecalis, Streptococcus-faecalim.

Data is presented on the survival of enteroccoci. coliforms and salmonellas (Streptococcus faecalis, Streptococcus faccium, Salmonella typhimurium, Salmonella typhi, Escherichi coli, Escherichia freundii) in river water. The ability of these organ-isms to multiply and survive in river water depended on the experimental methods and condi-tion of the microorganisms used in the experiment. uon of the microorganisms used in the experiment. S. faecalis, dying more quickly in water than S. faecium, can indicate fresh fecal contamination with greater reliability than the enterococci.—Copyright 1975, Biological Abstracts, Inc. W75-11973

EFFECTS OF THE COMMERCIAL POLYCHLORINATED BIPHENYL MIXTURE AROCLOR 1242 ON GROWTH, VIABILITY, PHOSPHATE UPTAKE, RESPIRATION AND OXYGEN EVOLATION IN SCENEDESMUS, Stockholm Univ. (Sweden). Botany Inst.

C-M. Larsson, and J-E. Tillberg. Physiologia Plantarum, Vol 33, No 4, p 256-260, 1975. 3 fig. 2 tab, 37 ref.

Descriptors: *Plant physiology, *Inhibition, *Aroclors, *Algae, Polychlorinated biphenyls, Viability, Chlorophyta, Phosphates, Respiration, Pesticides, Absorption, Food chains, Oxygen. Identifiers: *Scenedesmus obtusiusculus, Aroclor 1242, Phosphorylation, PCB.

To gain knowledge about physiological responses of microalgae to polychlorinated biphenyls, the unicellular green alga Scenedesmus obtusiusculus was grown in liquid media containing the commercial PCB mixture, Aroclor 1242 (10-1000 ppb). The algae did not respond to PCBs even in very high doses if they were added just before the experiment, so the algae were cultured in PCBs before the experiment. Growth was inhibited at 300 ppb and above and viability was only affected at 1000 ppb. Inhibition of phosphate uptake had almost the same appearance in light as in darkness, and may be largely caused by PCB action on the plasmalemma. Lower inhibiting concentrations did not affect oxygen uptake or oxygen evolution in hight. At 800 ppb some experiments indicated an upcoupling of oxidative phosphorylation and induced an increased respiration rate, but at 1000 ppb respiration was inhibited and oxygen output reduced. Although the PCB concentrations discussed are higher than those normally found in natural waters, it would not be impossible for some of these effects to occur under natural conditions, resulting in disturbance of basic food production in aquatic ecosystems. (Buchanan-Davidson-Wisconsin) W75-11974

N AND P DISTRIBUTION IN LAKE KINNERET (ISRAEL) WITH EMPHASIS ON DISSOLVED ORGANIC NITROGEN,

Israel Oceanographic and Limnological Research Ltd., Haifa.

C. Serruya, U. Pollingher, and M. Gophen. Oikos, Vol 26, No 1, p 1-8, 1975. 7 fig. 4 tab, 26 ref.

*Nitrogen, *Phosphorus, Descriptors: *Eutrophication, Subtropic, Nitrogen cycle, Ammonification, Denitrification, Nitrogen com-pounds, Plankton, Lake sediments, Anaerobic conditions, Fluctuations, Seasonal, Turnovers, Chelation, Distribution.

Identifiers: *Lake Kinneret(Israel), *Israel, Dissolved organic nitrogen, Peridinium cinctum, Nitrogen sources.

Fluctuations in the amount and distribution of different forms of nitrogen and total phosphorus and the role of dissolved organic nitrogen in the nitrogen cycle were studied in Lake Kinneret, Israel. Organic nitrogen originates from the watershed, plankton, and sediments. The high nitrogen input was compensated by denitrification during the anoxic period. Phosphorus concentration was limited by chemical equilibria. A dense dinoflagellate bloom develops in winter-spring. Distributions of nitrogen and phosphorus showed that lake water was the largest nitrogen pool, and sediments were the main phosphorus reservoir. There were seasonal and vertical fluctuations in dissolved organic nitrogen. Cell autolysis after the bloom released large amounts of dissolved organic nitrogen into the upper water layers. Another fraction sedimented and remained unchanged during the anoxic period. At the next turnover, the oxidative process produced more disssolved organic nitrogen which ammonified rapidly. Delay in ammonification and dissolved organic nitrogen accumulation may retard Peridinium cinctum bloom, probably because of the chelating effect of dissolved organic nitrogen. Large amounts of phosphorus are stored in sediments but relatively small amounts are released under anoxia, but phosphorus represents a potential danger of cutrophication. Minor lake level modifications may affect factors controlling storage and release

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION Group 5C-Effects Of Pollution

of phosphorus in sediments. (Buchanan-Davidson-W75-11975

RESPONSE OF LAKE SUPERIOR ALGAE TO NUTRIENTS AND TACONITE TAILINGS, Texas Univ. at Dallas, Richardson. Inst. for En-

vironmental Sciences.
R. H. Plumb, and G. F. Lee.

Journal Water Pollution Control Federation, Vol 47, No 3, p 619-629, 1975. 1 fig, 3 tab, 7 ref.

Descriptors: *Algae, *Eutrophication, *Lake Superior, *Nutrients, Phosphates, Carbon, Trace elements, Manganese, Magnesium, Zinc, Nitrates, Silica, Toxicity, Minnesota.

Identifiers: *Taconite tailings, *Reserve Mining Co., Silver Bay(Minn).

To determine the algal-limiting nutrients in Lake Superior, whether the limiting nutrient changes with time, the stimulation potential of taconite tailings, and algal response to taconite tailings at different times of the year, a nutrient spiking study was made primarily in the western arm of Lake Superior from November 1971 to May 1973. Ap-proximately 70-80% of all samples receiving phosphate in the study had a greater rate of carbon fixation. Trace metals (magnesium, copper, boron, iron, zinc, cobalt, molybdenum) stimulated 20% of the samples and manganese 8%, but nitrate and silica did not stimulate algal populations in Lake Superior. No seasonal fluctuations were observed in the responses of algae to nutrient spiking. Additions of taconite tailings did not stimulate the algae. Less than 5% of the tailings suspensions produced a net carbon fixation that was greater than that of lake water controls. It was concluded that Lake Superior algae will respond to phosphate additions. The fact that the algae responded to tailings plus phosphate but not to tailings along suggests that tailings do not contribute to eutrophi-cation of the lake and that taconite tailings are not toxic to algae. (Buchanan-Davidson-Wisconsin) W75-11976

PRIMARY PRODUCTION IN THE PLANKTON COMMUNITY OF A TROPICAL LAKE, Savannah River Ecology Lab., Aiken, S.C.

Ecological Monographs, Vol 44, No 4, p 377-409, 1974. 13 fig, 12 tab, 82 ref NSF GB 16054, AEC AT (38-1)310.

Descriptors: *Tropical regions, *Plankton, *Primary productivity, *Lakes, Weather, Water chemistry, Light penetration, Standing crops, Distribution, Fluctuations, Photosynthesis, Inhibition, Mixing, Stratification, Euphotic zone, Seasonal, Nutrients.

Identifiers: *Lake Lanao(Philippines), Philippines.

Primary production, weather, chemistry, light penetration, and standing crop studies of au-totrophs and heterotrophs were made of Lake Philippines. Diurnal rhythms in photosynthetic efficiency per lake surface area were not observed. Vertical profiles of were not observed. Vertical profiles of photosynthesis exhibited light inhibition except on overcast days. Inhibition threshold at the surface was lower in windy than calm weather. The mean inhibition threshold one meter or more deep was lower than at the surface. The lake was exceptionally transparent considering its high productivity and had a vertical dispersion of production due to low amounts of dissolved and suspended matter in the euphotic zone, high production per unit of standing crop, and extensive mixing in the upper water column. Autotrophs accounted for 80% of euphotic zone respiration. Seasonal variations were related to resource supply rather than to temperature or biomass removal. Incident light accounted for 12-30% of seasonal production variations. Light was limited by thickening of mixing zone during the circulation periods and storms. Nutrient supply was the dominant controlling factor during stratification. Nutrient depletion was relieved by changes in mixing depth during storms. High sustained production on a low nutrient base in explained by rapid nutrient transfer from the decomposition zone to the euphotic zone.
(Buchanan-Davidson-Wisconsin)

CLASSIFICATION OF WISCONSIN LAKES BY

TROPHIC CONDITION.
Wisconsin Dept. of Natural Resources, Madison.
Bureau of Water Quality.
Report April 15, 1975. 108 p, 3 tab, 18 append.

Descriptors: *Wisconsin, *Lakes, *Trophic level, *Classification, Water pollution, Legislation, Rehabilitation, Pollution abatement, Protection, Nuisance algae, Aquatic weeds, Winterkilling, Financing, Planning, Monitoring, Water management(Applied).
Identifiers: Inland Lakes Renewal Program.

In compliance with the 1972 Federal Water Pollution Control Act Amendments, all publicly owned, named lakes of all sizes, and unnamed lakes 20 acres or larger in Wisconsin are listed. There are 14,977 tabulated lakes covering 947,384 acres. 14,97/ tabulated lakes covering 94/,384 acres Four different classifications schemes are discussed. Of 1,153 lakes 100 acres or larger, 335 (29%) covering 402,157 acres show signs of eutrophication (winterkill, pollution, nuisance algae, macrophyte problems), while 818 (71%) algae, macrophyte problems), while 818 (71%) covering 367,504 acres did not. Another survey of 1,130 Wisconsin lakes (mostly 100 acres or larger) classified 28 lakes (2%) very oligotrophic, 308 (27%) oligotrophic, 586 (52%) mesotrophic, 158 (14%) eutrophic, and 50 (4%) very eutrophic. Seven appendices discuss techniques and experiences in developing methods and procedures for lake protection and rehabiliation in Wisconsin. Six appendices describe the various Wisconsin programs associated with lake classification and management. Also included are copies of the Wisconsin Inland Lake Protection and Rehabilitation Law and Administrative Rules for feasibility studies and project planning and implementation.
(Buchanan-Davidson-Wisconsin) W75-11979

THE UPTAKE AND UTILIZATION OF OR-GANIC CARBON BY ALGAE: AN ESSAY IN COMPARATIVE BIOCHEMISTRY,

Stockholm Univ. (Sweden). Arrhenius Lab. A. H. Neilson, and R. A. Lewin. Phycologia, Vol 13, No 3, p 227-264, 1974. 8 tab,

Descriptors: *Organic compounds, *Absorption, *Carbon, *Algae, *Biochemistry, *Metabolism, Reviews, Light, Lipids, Nitrogen, Amino acids, Chlorophyta, Cyanophyta, Carbon dioxide, Bacteria, Respiration, Photosynthesis, Alcohols, Carbon dioxide, Mode of action, Nutriant sequire. bohydrates, Mode of action, Nutrient require-

bohydrates, Mode of action, Nutrient require-ments, Plant growth substances.

Identifiers: *Heterotrophic algae, *Organic car-bon, Acetate, Fatty acids, Obligate photolithotrophy, Glycollate, Glycerol, Hexose, Pentose, Pyrimidine, Purine.

Organic compound uptake and utilization by algae in light and dark is reviewed and the mode of action compared with bacteria. No algae grows under anaerobic conditions or heterotrophically using only carbon compounds. Many assimilate exogenous acetate into lipids in light and dark. Some grow heterotrophically using saturated fatty acids. Obligately photolithotrophic algae incorporate long-chain fatty acids into lipids without prior degradation. Some assimilate glycollate in light. Glycerol is a substrate for many in light and dark. Hexoses are also used for heterotrophic growth. Pentoses inhibit growth of many algae in light, but ribose and xylose support heterotrophic growth of some green and blue-greens. Amino acids are used as nitrogen sources by several algae for growth in light and sometimes improve

heterotrophic growth in dark. Pyrimidines and purines do not support heterotrophic growth, but runcil, uric acid, and adenine can be nitrogen sources for growth of green and blue-green algae in light. Hypotheses to explain obligate photolithotrophy are discussed. No single explana-tion reconciles the reasons why many algae which grow in light using carbon dioxide cannot grow heterotrophically in dark. Generally heterotrophic algae have too low an affinity for most substrates to compete effectively with bacteria under natural conditions. (Buchanan-Davidson-Wisconsin) W75-11980

GEOCHEMISTRY AND NUTRIENT REGIME OF SALINE EUTROPHIC LAKES IN THE **ERICKSON-ELPHINSTONE** DISTRICT SOUTHWESTERN MANITOBA.
Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst.

Technical Report No 511, 1975. 86 p, 24 fig, 19 tab, 86 ref, 1 append.

Descriptors: *Geochemistry, *Nutrients, *Eutrophication, *Saline lakes, *Canada, Chemical properties, Ice cover, Salinity, Ions, Sodium, Potassium, Magnesium, Magnesium, Ion, Chlorides, Sulfates, Hydrogen ion concentration, Specific conductivity, Seasonal, Fluctuations, Water properties, Dissolved oxygen, Hydrogen sulfide, Nitrogen, Phosphorus, Carbon, Silica Planton, Biomass, Chleophyll, Eishkill Silica, Plankton, Biomass, Chlorophyll, Fishkill, Amonia, Aquaculture, Winterkilling. Identifiers: *Manitoba, Summerkill.

A chemical characterization of prairie winterkill A chemical characterization of prainte wintershall alakes of the aquaculture experimental area in the Erickson-Elphinstone district, southwestern Manitoba, is presented. The 79 saline winterkill pothole lakes studied showed variability in salinity and ionic composition: total ions 268-9720, sodium 1.6-980, potassium 11.2-248, magnesium 9-1236, calcium 28-336, iron 0-0.18, manganese 0-2.14, chloride 1-191, sulfate 12-6571 mg/l. The pH varied 7.4-9.6; and specific conductance 305-7837 micromhos/cm. Of these lakes, 44.4% belonged to the true sulfate-magnesium type; 16.7% to the intermediate sulfate-bicarbonate, magnesium type; 11.1% to the intermediate sulfate-bicarbonate, magnesium-calcium type; and 27.8% to intermediate and mixed types. Seasonal variations in water comparation were observed. water composition were observed. Fifty-one lakes used for summer fish farming were monitored for dissolved oxygen, hydrogen sulfide, nitrogen, phosphorus, carbon, silica, and plankton biomass (as particulate carbon, nitrogen, phosphorus, and chlorophyll-a). Winterkill and summerkill anoxic ons were studied. Summer fish kills occurred in lakes with chlorophyll-a concentrations exceeding 100 micrograms/1 and specific conductance between 800-2000 micromhos/cm. Correlation between winter maxima of ammoniasummer was found. Major nutrient sources in lake basins were evaluated. (Buchanan-Davidson-

THE EFFECT OF WIND ON THE SPREAD OF CONTAMINATION IN THE YEISK ESTUARY. (IN RUSSIAN), For primary bibliographic entry see Field 5B. W75-11983

ENDOCYTOSIS OF MICROCYSTIS AERU-GINOSA BY OCHROMONAS DANICA. G. T. Cole, and M. J. Wynne.

Journal of Phycology, Vol 10, No 4, p 397-410, 1974. 27 fig, 68 ref.

Descriptors: *Algal control, *Ochro *Chrysophyta, *Algae, Diets, Cyan Cytological studies, Digestion, Biocontrol. ontrol, *Ochromonas, Diets, Cyanophyta,

WATER QUALITY MANAGEMENT AND PROTECTION-Field 5 Effects Of Pollution—Group 5C

Identifiers: *Endocytosis, *Microcystis aeru-ginosa, Ochromonas danica, Cannibalism.

Ochromonas danica Prings. is a chrysomonad alga which shows a high degree of nutritional versatili-ty and is capable of feeding on the toxic blue green alga, Microcystis aeruginosa Kuetz. Light microscopic, electron microscopic, and cytochemical examinations of endocytosis in Ochromonas showed engulfment of M. aeruginosa and subsequent digestion. Contact occurred at the anterior end of Ochromonas. Two kinds of vacuoles formed. M. aeruginosa was enclosed by a primary food vacuole or primary endosome, which immediately began to migrate toward the posterior pole of the cell causing lateral distension. This primary endosome soon fused with the posterior food vacuole or secondary endosome and released its contents into this digestive organelle. Six or eight M. aeruginosa cells can accumulate in the secondary endosome until Ochromonas become spherical in shape. Digestion occurs in the secondary en-dosome and M. aeruginosa is completely broken down. The greatest rate of endocytosis occurred during the first nine minutes after combining the two organisms. Onset of endocytosis had a disruptive effect on the anterior microtubule nucleating sites. The chrysomonad was cannibalistic but also had an appetite for many different kinds of organ-isms. This alga could be used to develop a mechanism of biological algal control. (Buchanan-Davidson-Wisconsin) W75-11985

THE UTILIZATION OF PHOSPHORUS FROM MUDS BY THE PHYTOPLANKTER, SCENEDESMUS DIMORPHUS, AND THE SIGNIFICANCE OF THESE FINDINGS TO THE PRACTICE OF POND FERTILIZATION,

Alabama Agricultural Experiment Station, Au-

C.J. Chiou, and C. E. Boyd. Hydrobiologia, Vol 45, No 4, p 345-355, 1974. 1 fig, 4 tab, 17 ref.

Descriptors: *Fish farming, *Algae, *Phosphorus, *Mud-water interfaces, *Soil types, *Growth rates, Phytoplankton, Scenedesmus, Fertilization, Solubility, Bottom sediments, Phosphates, Cultures, Inorganic compounds.
Identifiers: Phosphorus sources.

To study the availability of phosphorus in muds for phytoplankton growth, muds were prepared from twelve soil types and used as the only phosphorus source for growth of Scenedesmus dimorphus. Some muds supported as much algal growth as was obtained with 0.075 to 0.5 mg Plywhile little or no growth occurred with cultures. while little or no growth occurred with cultures using other muds. When the soils were extracted with a phosphorus-free nutrient solution, a mixture of hydrochloric acid and sulfuric acids, a solution of sulfuric acid and potassium sulfate, or a solution of hydrochloric acid and ammonium fluoride, it was shown that soils differed primarily in the quantity of phosphorus present rather than the forms of phosphorus present. The soils contained various proportions of iron, aluminum, and calcium phosphates. Additions of phosphorus to the soils prior to their use as mud increased the suitability of some as phosphorus sources but in other soils the added phosphorus was so tightly bound that little or no phosphorus was so tightly bound that little or no phosphorus was available for S. dimorphus growth. The type of soil in a pond will likely have a large influence on the efficiency of fertilization with phosphate fertilizers to sustain phytoplankton growth in fish ponds. (Buchanan-Davidson-Wisconsin)

THE EFFECT OF HYDROGEN IN CONCEN-THE EFFECT OF HYDROGEN IN CONCE TRATIONS IN SIMULATED RAIN ON T MOSS TORTULA RURALIS (HEDW.)SM, Montana Univ., Missoula. Dept. of Botany. R. P. Sheridan, and R. Rosenstreter. Bryologist, Vol 76, No 1, p 168-173, Illus, 1973.

Descriptors: *Chlorophyll, *Hydrogen ion con-centration, Simulated rainfall, *Mosses, Photosynthesis, Respiration, Sulfuric acid, Ox-Identifiers: *Tortula-ruralis

Gametophores of T. ruralis were treated with sulfuric acid solutions at pH values of 1.0-6.0. The concentration of chlorophylls a + b decreased between pH6 and pH3 followed by a more rapid decline between pH3 and pH1. Chlorophyll a was more sensitive to acid than chlorophyll b. Oxygen production based on chlorophyll was relatively unaffected between pH6 and pH2, whereas photosynthesis based on dry weight decreased uniformly in relation to decrease in pH. Respiration was insensitive to pH values as low as pH2. Simulated acid rain appeared to effect a reduction in photosynthesis largely through acid hydrolysis of chlorophyll a.—Copyright 1973, Biological Abstracts. Inc. W75-11987

STUDIES ON METABOLIC ACTIVITY OF BENTHIC BACTERIA ISOLATED FROM BACTERIA ISOLATED FROM

Nicolas Copernicus Univ. of Torun (Poland). Lab.

of Microbiology.
E. Strzelezyk, U. Leniarska, and W. Donderski. Acta Microbiologica Polonica, Ser. B, Vol 6, No 13, p 125-132, 1974. 4 fig, 1 tab, 15 ref.

Descriptors: *Metabolism, *Bottom organisms, *Carbohydrates, *Bacteria, Respiration, Trophic

*Caroonydrates, *Bacteria, Respiration, Tropnic level, Food habits, Nutrient requirements, Seasonal, Oxygen requirements. Identifiers: *Poland, *Lake Jeziorak(Poland), *Lake Tynwald(Poland), *Lake Jasne(Poland), Glucose, Fructose, Maltose, Arabinose, Xylose, Ribose, Cellobiose, Casamino acids.

Metabolic activities of 480 isolates of benthic bacteria on nine substrates (glucose, fructose, maltose, arabinose, xylose, ribose, cellobiose, soluble starch, and casamino acids) which are often in respiratory studies and which possibly occur in natural environments were studied. The bacteria were obtained from bottom sediments of Lakes Jeziorak and Tynwald (eutrophic) and Jasne (mesotrophic) in northern Poland. Glucose and fructose were the most frequently attacked car-bohydrates, but some strains isolated from all lakes in winter failed to utilize these sugars. Depending on time of isolation, some strains respired actively on the substrates but others did not. The most metabolically active strains were from Lake Jasne, the least active from Lake Tynwald. Many isolates did not attack arabinose; those which respired actively. With many isolates no oxygen uptake was observed on ribose, xylose, cellobiose, and starch; those from Lakes Jasne and Jeziorak which used these carbohydrates respired more actively than Lake Tynwald isolates. Most benthic bacteria did not attack soluble starch. Respiratory values on casamino acids were generally higher than those on carbohydrates, but many strains showed no oxygen uptake. In general metabolic activity depended on time of isolation. No differences were observed between chromogenic and non-chromogenic bacteria. (Buchanan-Davidson-Wisconsin) W75-11988

BIOLOGICAL AND CHEMICAL MECHANISMS IN EUTROPHICATION OF FRESHWATER

LAKES,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. D. W. Schindler, and D. R. S. Lean.

Annals New York Academy of Sciences, Vol 250, p 129-135, 1974. 4 fig, 21 ref.

Descriptors: *Biological properties, *Chemical properties, *Eutrophication, *Analytical techniques, Methodology, Testing procedures, Estuaries, Lakes, Measurement, Limiting factors,

Phosphorus, Primary productivity, Standing crops, Mode of action, Productivity, Phosphorus compounds, Chemical analysis, Nitrogen compounds, Carbon, Crop response, Light penetra-tion, Turbidity, Hudson River. Identifiers: *Hudson Estuary.

No methodology has been developed to study estuarine eutrophication. Errors in accepted limnological methods and beliefs affect interpreta-tions of results. Phosphorus is the element most responsible for eutrophication but no technique positively identified any form of phosphorus in natural waters as different methods provide differing results. High phosphorus concentrations in the lower hypolimnion of lakes may not be due to feedback from sediment but toe phosphorus-containing seston sedimentation; little phosphorus that reaches sediments is returned to the euphotic zone. Under oxic conditions phosphorus should precipitate as ferric phosphate or coprecipitate with ferric hydroxide; under anoxic conditions reduction to iron should precipitate iron sulfide and release phosphate ions, but little phosphorus release is observed. Bioassays indicate nutrients limiting productivity but do not identify nutrients which caused earlier productivity increases. Standing crop determinations are more relevant standing crop determinations are into research than primary production results and are deter-mined by phosphorus and nitrogen supplies (carbon influences growth rate); standing crops are also affected by both death and birth rates. Primary production is dependent on light; but silt may reduce photosynthesis and prevent algal growth. Attempts to alleviate eutrophication of Hudson Estuary should not be based on single factors with simplistic solutions which could be costly or dangerous. (Buchanan-Davidson--Wisconsin)

DISTRIBUTION AND BIOMASS MACROPHYTES IN LAKE DGAL MALY, Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). For primary bibliographic entry see Field 81. W75-11993

TRANSFER OF HEAT, FRESH WATER AND NUTRIENTS THROUGH THE SEASONAL THERMOCLINE.

Institute of Oceanographic Sciences, Wormley (England).

(England). R. D. Pingree, and L. Pennycuick. Journal Marine Biological Association of the United Kingdom, Vol 55, No 2, p 261-274, 1975. 9 fig. 1 tab, 23 ref.

Descriptors: "Mixing, "Sea water, "Salinity, "Phosphates, "Seasonal, "Thermocline, Water temperature, Vertical migration, Advection, Circulation, Productivity, Heat, Fresh water, Cycling nutrients.

Identifiers: *English Channel.

Changes in water column temperature at an English Channel station between 1902-1961 were used to determine the mean monthly heating and used to determine the mean monthly heating and mean rate of vertical mixing of the water column. Lower layers are heated by mixing heat downwards, not by advection. Rate of vertical mixing at different depths was derived from rate of warming beneath the thermocline. In summer transfer of fresh water through the thermocline transfer of fresh water through the thermocline reduced salinity in the bottom mixed water layer. Major changes in mean salinity below the ther-mocline were caused by vertical mixing. In winter advection of salty water was largely responsible for increase of salinity. Mixing rates were used to estimate inorganic phosphate transfer rate through the thermocline. Phosphate distribution was sta-tionary and at a minimum in summer. Balance between regeneration and uptake was achieved and maximum production, based on phosphate utilization, occurred in the thermocline. Maximum rate of inorganic phosphate regeneration occurred in May/June, with a minimum in February. Salini-

Group 5C-Effects Of Pollution

ty variations due to advection and horizontal turbulence maintained their identities despite local evaporation, precipitation, and vertical mixing.

Monthly changes in phosphate are partly due to
local effects plus development and dissipation of the thermocline; large advective effects do not sig-nificantly affect monthly variations. (Buchanan-Davidson--Wisconsin) W75-11994

SEASONAL PREVALENCE OF CHONDROCOC-CUS COLUMNARIS INFECTION IN BLACK BULLHEADS FROM CLEAR LAKE, IOWA, Iowa State Univ., Ames. Dept. of Zoology and Entomology. P. R. Bowser.

J Wildl Dis, Vol 9, No 2, p 115-119, 1973.

Descriptors: *Iowa, *Fish diseases, *Bullheads, Seasonal, Lakes, Infection, Fish pathology.
Identifiers: Black bullheads, *Chondrococcuscolumnaris, *Clear Lake(Iowa).

The prevalence of asymptomatic columnaris infection in black bullheads (Ictalurus meals) from Clear Lake, Iowa, during 1971 was the highest during the spring when the lake was warming, very low as summer approached and nil from July 28 through the autumn. The mean condition factor of adult black bullheads decreased through June and fluctuated at a lower level through the remainder of the summer and autumn. Mean hematocrit of adult black bullheads followed the same trend as that of condition factor. A positive correlation was evident between weekly mean condition factor and hematocrit (r = 0.90; P - 0.01).--Copyright 1973, Biological Abstracts. Inc.

MORPHOLOGY AND ULTRASTRUCTURE OF SOME CHLOROCOCCAL ALGAE FROM THE COLLECTION PF ALGAL STRAINS IN LENIN-GRAD UNIVERSITY. II. MONORAPHIDIUM BRAUNII (NAG, IN KUTZ.) KOMARKOVA-LEGNEROVA STRAIN (GROMOV) 1967/231, Leningrad State Univ. (USSR). Biological Inst. B. V. Gromov, K. A. Mamkaeva, and V. F.

Archiv fue Hydrobiologie/Supplement 46, Algological Studies 11, p 140-150, 1974. 4 plates, 2 tab, 22 ref.

Descriptors: *Plant morphology, *Chlorophyta, *Systematics, Soil algae, Life cycles, Cytological Identifiers: *Monoraphidium braunii, Chlorococ-

Monoraphidium braunii strain Gromov 1967/231 was isolated from a cotton field near Tashkent, USSR, and possesses ultrastructural patterns usual for chlorococcal algae. Its cells are solitary, 6-40 microns long, 3-18 microns thick. Young cells are straight or slightly curved with pointed ends.

During reproduction 4-16 autospores form by division of the protoplast and are liberated by transverse rupture of the mother cell. The pyrenoid is in the middle of the cell in the periphery of the chloroplast, and contains thylakoid stacks and sometimes granum-like stacks interconnected by thylakoids. Starch grains are often located near the pyrenoid but do not form a regular envelope. Several types of large vesicles are found in the cytoplasm of young cells consisting of cytoplasm of young cells consisting of microbodies, lamellated inclusions, and large electrontransparent homogeneous ovoid globules. Microbodies are especially numerous in cells from old cultures. Dictyosomes are well-developed. Vesicles bud off the golgi cisternae. The outer membrane of the nuclear envelope is continuous with the endoplasmic reticulum. Chlorophylls-a and -b, alpha- and beta-carotenes, canthaxanthin, cryptoxanthin, lutein, luteinmonepoxide, violaxanthin, neoxanthin NeoA, neoxanthin, and trigydroxy-alpha-carotene are present. Alpha-cryp-toxanthin and trihydroxy-alpha-carotene are detected only in young cells; canthaxanthin and luteinmonoe-poxide were found only in old cells. (Buchanan-Davidson--Wisconsin) W75-11997

MORPHOLOGY AND ULTRASTRUCTURE OF SOME CHLOROCOCCAL ALGAE FROM THE COLLECTION OF ALGAL STRAINS IN LENIN-GRAD UNIVERSITY. I. PSEUDOSPONGIOCOC-CUM PROTOCOCCOIDES GEN. NOV., SP. NOV.,

Leningrad State Univ. (USSR). Biological Inst. B. V. Gromov, and K. A. Mamkaeva.

Archiv fur Hydrobiologie/Supplement 46, Algological Studies 10, p 1-9, 1974. 1 fig, 3 plates, 9

Descriptors: *Plant morphology, *Chlorophyta, *Systematics, *Soil algae, Life cycles, Cytological

*Pseudospongiococcum protococ-Identifiers: coides, Chlorococcus.

A taxonomical description of the newly identified Pseudospongiococcum protococcoides and its ultrastructural morphology is given. It was isolated from the surface of a Crimean soil. It forms a comfrom the surface of a Crimean soil. It forms a com-pact sediment in liquid media; on agar it forms round, dark green colonies. No slime was ob-served. Cells were usually isolated or in smal groups and are nonmotile. Young cells are spheri-cal or ellipsoidal and mature cells are spherical with a maximum diameter of 25 microns. The cell wall is thick with no extracelluiar matrix, contains cellulose, and has an outer membrane-like layer and an inner electron-transparent matrix which is not homogeneous. Invaginations of cell wall material into the cell body and tubular or lamellar material into the cell body and tubular or lamellar protrusions of the cell wall were sometimes observed. Cytoplasmic material formed tubules in the cell wall matrix. Mature cells are multinucleate, liberating 2-32 autospores through the cell wall; autospores contained one nucleus. Reproduction is only by autospores. In small young cells the chloroplasts are spongy and in large cells net-like. Mature cell chloroplasts consist of obloge partitions interconnected by short sist of oblong partitions interconnected by short bridges with small mitochondria and vacuoles between them; the partitions included 3-10 thyla-koid stacks, each of three thylakoids. (Buchanan-Davidson-Wisconsin) W75-12000

DETERGENT PHOSPHORUS AND ALGAL GROWTH, Wabash Coll., Crawfordsville, Ind. Dept. of Biolo-

gy. W. N. Doemel, and A. E. Brooks. Water Research, Vol 9, No 3, p 713-719, 1975. 6

Descriptors: *Phosphorus, *Detergents, *Growth rates, *Algae, Eutrophication, Sewage treatment, Chemical precipitation, Chlorella, Chlamydomonas, Euglena, Anabaena, Indiana, Nutrient removal.

The effects of phosphorus reduction by chemical precipitation in sewage and use of non-phosphorus detergents on algal growth were determined by mixing treated sewage with lake and river waters and measuring the growth of Chlorella pyre-noidosa. The total biomass of two strains of C. pyrenoidosa, Chlamydomas reinhardtii, Euglena pyrenouosa, chamydomas reimandrui, Eugiena gracilis, Anabaena flos-aquae, and Plectonema boryanum were determined when the algae were grown in three Indiana lake waters which had been supplemented with sewage effluents. Algal growth was not significantly decreased when the total observations was reduced \$50%, but alkeling test. phosphorus was reduced 50% by alkaline treat-ment. When C. pyrenoidosa was grown in water to which sewage effluents from a motel treatment system were added, in which reactive phosphorus was reduced 57% by supplying the motel with nonphosphorus cleaning products, no reduction in algal growth was also observed. Only when

sewage effluents were advance treated so that reactive phosphorus levels were below 1.2 mg/l (reduced 92%) was algal growth significantly decreased. The data support the contention that the only effective means of phosphorus removal is by advanced treatment in which 90-95% of the phosphorus is removed from municipal wastes and that the removal of phosphorus from detergents will be insufficient to reduce algal growth in most bodies of water. (Buchanan-Davidson--Wisconsin)

DANGER SIGNS FOR TAHOE'S FUTURE, California Univ., Davis. Div. of Environmental C. R. Goldman, and T. A. Cahill. Cry California, Spring 1975. 6 p, 4 fig, 1 tab.

*Water quality, Descriptors: Eutrophication, Urbanization, Primary produc-Eutophication, Oroanizaton, Finany productivity, California, Daphnia, Algae, Fish stocking, Zooplankton, Nevada, Land use, Planning, Fish food organisms, Air pollution, Sulfur. Identifiers: *Lake Tahoe(Calif), Carbon monox-

Since 1959 qualitative measurements of Lake Tahoe's water have shown increasing fertility.

Algal growth rose 25% between 1968-1971; since then algal growth has increased but the annual rate of increase has dropped. Synoptic studies showed that high-fertility water masses are gradually spreading over the entire lake surface. Zooplank-ton-Daphnia rosea, Daphnia pulex, and Bosmina longirostris--have disappeared, perhaps due to in-troduction of opossum shrimp (Mysis relicta) and red salmon fry. Their disappearance may be con-tributed to the lake's green algal crop increase. Tahoe is still oligothrophic; if nutrient inflow can Tahoe is still oligothrophic; if nutrient inflow can be retarded, this low fertility might be preserved. Air quality of the basin is also declining. A 1973 California Air Resources Board study revealed that eye-stinging oxidants were half as dense at Tahoe as in Los Angeles, but carbon monoxide, hydrocarbon, and lead levels were higher. Atmospheric aerosols—sulfur-containing particulates, fine soil, and automobile pollutants—are the major cause of reduced visibility. Sulfur-contains major cause of reduced visibility. Sulfur-contain-ing particulates result from combustion of fuel oil utomobiles and planes, are a by-product of automobile catalytic converters, and may be carried tomotic catalytic converters, and may be carried into the area by wind. Through sound, strictly enforced land development restrictions, Tahoe's beauty can still be preserved. (Buchanan-Davidson-Wisconsin) W75-12002

AN ECOLOGICAL EVALUATION OF HEATED WATER DISCHARGE ON PHYTOPLANKTON BLOOMS IN THE POTOMAC RIVER,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology. G. M. Simmons, and B. J. Armitage. Hydrobiologia, Vol 45, No 4, p 441-465, 1974. 10 fig, 6 tab, 21 ref.

Descriptors: *Phytoplankton, *Eutrophication, *Potomac River, *Thermal pollution, Virginia, Dominant organisms, Biological communities, Algae, Cyanophyta, Growth rates, Nuisance algae, Powerplants, Nutrients, Oxygen, Nitrogen, Nitrates, Phosphates, Water temperature, Varie-

Identifiers: Microcystis aeruginosa.

An eight month ecological study of the Virginia side of the Potomac River indicated that the thermal discharge of the Possum Point Power Station had no effect on the density or composition of algal blooms in the Potomac River. Of the 47 taxa of algae identified, blue-green species predominated during periods of accelerated growth. Microcystis aeruginosa was the dominant species in algal mats. Evidence of nuisance algal blooms was first observed upstream from the power plant, and mean algal densities were 40-50%

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

greater upstream. The mean nutrient levels (especially nitrate nitrogen and orthophsophate) at upstream control stations were slightly less due to algal uptake. It was concluded that the Occoquan and upper Potomac River areas are sites of major algal blooms caused by nutrient loadings from upstream areas; then the mats appear to drift into downstream areas. There was no evidence that the Possum Point Power Station added nutrients. The mean temperature of the water in the heated water zone was approximately 4.5C higher than water in front of the plant or upstream; oxygen require-ments were reduced 0.9 mg/l but oxygen saturation values were elevated 20.0%. (Buchanan-Davidson--Wisconsin)

A QUANTITATIVE MEASURE OF SUCCESSION RATE AND ITS APPLICATION TO THE

California Univ., Davis. Inst. of Ecology.
A. D. Jassby, and C. R. Goldman.
American Naturalist, Vol 108, No 963, p 688-693, 1974. 2 fig, 6 ref. NSF GB-35371

Descriptors: *Succession, *Phytoplankton, *Mode of action, Biological communities, Mathematical models, Measurement, California, Identifiers: *Succession rate, Castle Lake(Calif).

To quantitatively analyze relationships between ssion and macroscopic ecosystem processes believed responsible for succession, the parameter 'succession rate' is introduced to measure rate of change of species composition in natural commu-nities. A time series of component species biomasses is the only data required to evaluate succession rate for a given community. Succession rates in Castle Lake, California, a dimictic mesotrophic lake, are given. Phytoplankton were collected about every five days at 0-30 m following conected about every livet ways at 0-30 in bothwing spring overturn, counted in a phase contrast microscope, converted to cell volume for each of the 140 species, and the total volume of each species in a water column determined by trapezoidal integration. Succession rates decreased with time from May to August and were consistent with stabilization of the community composition after external perturbation. Decreasing succession rates may be attributable to decreasing fluctuations in ependent factors. The succession rate can independent rate can determine the relative importance of factors inducing succession and help identify man-made disturbances of aquatic ecosystems before consequences such as accelerated eutrophication occur. Introduction of molybdenum into the epilimnion caused the succession rate to reach absentile that the control of the control o ormally high values immediately because of a Dinobryon sertularia biomass increase. Correla-tions between succession rate and watershed events can pinpoint disturbances. (Buchanan-Davidson--Wisconsin) W75-12005

RATES OF SUPPLY OF NITROGEN AND PHOSPHORUS TO LAKE WINNIPEG, MANITOBA, IN RELATION TO THE DIVER-SION OF MISSOURI RIVER WATER INTO THE RED AND ASSINIBOINE RIVERS, Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst.

G.J. Frunskii.
Freshwater Institute Reprint No 341, from 'Garrison Diversion Project Presentations, 'W. G. Leitch and J. J. Keleher, editors. Manitoba En-vironmental Council Study No 2, September 1974. 16 p, 1 fig, 3 tab, 3 ref.

Descriptors: *Eutrophication, *Alteration of flow, *Nutrients, Water quality, Ecology, Migration, Fish migration, Environmental effects, Canada, Diversion, North Dakota, Lakes, Rivers, Missouri River, Phosphorus, Nitrogen, Irrigation water. Identifiers: *Garrison Diversion(ND), *Lake Winnipeg(Manitoba), Red River(Manitoba), Assiniboine River(Manitoba).

To study rate of nutrient supply to Lake Winnipeg in relation to the Garison Diversion Project in North Dakota, water samples were analyzed. Levels of phosphorus and nitrogen in the rivers of the watershed and lake indicated mesotrophy. However over 80% of the phosphorus and 60% of the nitrogen were added to the South Basin which indicated eutrophication. Frequent blooms of Anabaena flos-aquae and Microcystis aeruginosa were observed. C14 uptake studies indicated that algal growth was probably limited by light penetra-tion. The North Basin received less suspended sediment, was clearer, and concentrations of nitrogen, phosphorus and silica were reduced in mid-summer after blue-green algal blooms. Addi-tion of Missouri River water to the watershed sould be less than 1% of total Red River inflow, might carry about 70 metric tons of phosphorus. 280 tons nitrogen, and 28,000 tons suspended sediment per year; and would probably have an unde-tectable effect on eutrophication of Lake Winnipeg. At least 12 species of fish occur in the Mis-souri drainage basin which are absent in the Lake Winnipeg drainage basin; of these the gizzard shad (Dorosoma cepedianum) may be detrimental. Migration of aquatic plants and animals may also be of concern. (Buchanan-Davidson--Wisconsin) W75-12006

PICK-UP AND METABOLISM OF DDT, DIEL-DRIN AND PHOTODIELDRIN BY A FRESH WATER ALGA (ANKISTRODESMUS AMAL-LOIDES) AND A MICROCRUSTACEAN (DAPHNIA PULEX), Illinois Univ., Chicago. Dept. of Biological

S. Neudorf, and M. A. Q. Khan.

Bulletin of Environmental Contamination and Toxicology, Vol 13, No 4, p 443-450, 1975. 2 fig, 3 tab, 27 ref. PHS ES-00808.

Descriptors: *Chlorinated hydrocarbon pesticides, Descriptors: "Chiorinated nydrocarbon pesticites, "Pesticide residues, "Uptake(Biological), Metabolism, DDT, Dieldrin, Algae, Daphnia, Ab-sorption, Adsorption, Metabolism, Solubility, Identifiers: "Chemical transformation, Photodiel-drin, Ankistrodesmus amalloides, Daphnia pulex, Biological magnification.

To determine the fate of insecticides in fresh water food chains, the absorption/ adsorption and metabolism of DDT, dieldrin, and photodieldrin metabolism of DD1, delearin, and photodicidarin by the fesh water alga, Ankistrodesmus amal-loides, and microcrustacean, Daphnia pulex, were studied. Total pick-up of DD1 by A. amalloides, during 1-3 hours was 2.5 times higher than that of dieldrin and 10 times higher than that of photodieldrin and seemed related to their water solubilities Uptake efficiency decreased with increased cell density. For A. amalloides maximum absorption time was 120 minutes for DDT, 30-60 minutes for dieldrin, and 30 minutes for photodieldrin. The cells continued to absorb adsorb DDT and dieldrin slowly, but photodieldrin concentration in cells did not increase up to three hours. Dieldrin was magnified 2-3 times less and photodieldrin about 6 times less than DDT by A. amalloides. This alga has a very low affinity for photodieldrin, the most polar (least lipohilic) of the insecticides. A. amalloides metabolized DDT to DDE (2.50). not increase up to three hours. Dieldrin was magpides metabolized DDT to DDE (3.5%) ang DDD (0.8%). Daphnia pulex showed 13.6% conversion of DDT to DDE. No other DDT metabolites were detected. (Buchanan-Davidson--Wisconsin) W75-12007

REPORT OF THE FRESH-MATER BIOLOGICAL INVESTIGATION UNIT.
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
Department of Agriculture for Northern Ireland.

Descriptors: *Water pollution *Algae, *Eutrophication, *Investigations, *Algae, Phosphorus, Nutrients, Fertilizers, Phosphorus compounds, Nitrates, Nitrogen, Cultures, Growth rates, Agricultural runoff, Sewage effluents, Nutrient removal, Watersheds(Basins), Forestry, Forest soils, Limiting factors, Bioa Cyanophyta, Diatoms, Zooplankton, Silica. Bioassays, Neagh(No Ireland), River Main(No Ireland), Lough Erne(No Ireland), Alkaline phosphatase activity, Otho-phosphate budget, Creatine

The Freshwater Biological Investigation Unit of Northern Ireland was established to investigate algal blooms in Lough Neagh, and was expanded to other water bodies. Phosphorus is the critical nutrient limiting algal production in Lough Neagh. Soluble ortho-phosphate is the form most readily utilized; 24% comes from agriculture and land drainage. In the River Main catchment area, less that 10% nitrate nitrogen and other nutrients were from point sources indicating that nutrients other than phosphorus cannot be significantly reduced by removal at point sources. The effects of afforestation of nutrients in upland water bodies were studied. Reservoir phosphorus concentrations were close to values predicted from known phosphorus fertilizer applications, but high phosphorus concentrations were not necessarily associated with algal blooms; some other nutrient was limiting algal growth. Although high alkaline phosphatase activity levels indicated phosphorus limited algal growth, the level in the River Main was higher than in Lough Neagh. Cultures of algae were prepared to study growth characteristics and nutrition. The relationship between phosphorus concentration and growth rate of Oscillatoria redekei was studied. Algae grew faster in Lough Neagh than in the laboratory due to light condi-tions. Chlorphyll-a distribution and the phsophorus budget for Lough Erne were deter-mined. (Buchanan-Davidson--Wisconsin) W75-12008

EUTROPHICATION, Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. D. W. Schindler.

D. W. Schmider. In: 'The Allocative Conflicts in Water-Resource Management,' Agassiz Center for Water Studies, University of Manitoba, Winnipeg, 1974, p 255-266, 2 fig, 10 ref. (FWI Reprint No 342).

Descriptors: *Eutrophication, *Water pollution sources, Phosphorus, Nitrogen Fertilization, sources, Phosphorus, Nitrogen Pertuization, Agricultural runoff, Sewage effluents, Feed lots, Forest management, Environment, Pesticides, Social aspects, Governments, Water pollution control, Recycling, Sewage treatment, Sewage disposal, Water treatment, Watershed management, Canada

Identifiers: Sewage irrigation systems, Sewage

Phosphorus and nitrogen account for most eutrophication problems. Fertilization of terrestrial ecosystems can be controlled, but no satisfactory domestic waste controls have been devised. Algal species responding to these nutrients often produce noxious tastes, odors, toxins, mats, or scums. Oxygen used in the decay processes suf-focates other organisms. Sewage effluents,

Feedlots, agricultural fertilizers, and poor forest management all contribute to eutrophication. Present Canadian agencies are inefficient in controlling pesticides which can act as toxins. A sewage irrigation system that can jointly act as a terrestrial nutrient source and water purification plant could recycle nutrients in an ecosystem with less danger of pollution and eutrophication than importation of fertilizers. Soil percolation and crop demand could serve as sewage treatment plants. Cost of fertilizers, eutrophication control, sewage disposal, and water purification could be sewage disposal, and water particular could be substituted by cost of transporting sewage for ter-restrial recycling and could be shared by urban and rural dwellers. Problems of accumulation of heavy metals, pesticides, and toxic wastes in farm produce; health and odor problems in sewage ir-rigated areas; leakage of nitrogen in soils; and

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winter storage of effluents would have to be resolved. A long range, sound environmental policy must be instituted. (Buchanan-Davidson-Wisconsin) W75-12010

WILL BAIKAL AND TAHOE BE SAVED, California Univ., Davis. Div. of Environmental Studies. C. R. Goldman.

Cry California, Winter 1973/74, 7 p.

Descriptors: *Eutrophication, *International commissions, *Foreign research, California, Commercial fish, Urbanization, Water pollution effects, Aquatic life, Aquatic populations, Lumbering, Soil erosion, Tourism, Nevada, Industrial wastes, Water pollution sources, Limnology, Hydrology, United States, Environmental effects, Air pollution, Snow removal, Sediment discharge. Identifiers: *Lake Baikal(USSR), *Lak Tahoe(Calif.-Nev.), Scientific exchange program.

An exchange program between the United States and the Soviet Union to reduce water pollution in-vestigates Lake Tahoe, California-Nevada and Lake Baikal, USSR. Lake Baikal, the world's oldest, largest, and deepest freshwater lake is very clear, low in minerals, and contains nearly 600 plant and 1200 animal species, three-quarters of which are endemic. Although cellulose plant effluents meet water quality standards for human consumption, they may be lethal to lake organisms. Omul are declining due to overfishing and use of spawning streams for log flotation. Logging, soil erosinon, tourist activities, and industrial developments are causing eutrophication. USSR's Hydrometeorological Services conduct extensive limnological research on effects of man's activities on the lake's hydrological, chemical, and biological processes. Lake Tahoe is less complex and has a less diversified aquatic population. An environ-mental research program, Research Applied to National Needs, is monitoring Tahoe's physical and biological condition and surrounding terrestrial environment. University Extension and political science programs have been established to speed application of research results. Both areas have air pollution and snow removal problems; California is now studying the Soviet Union's method of snow disposal. Solutions to these problems will depend on governmental ability to use scientific evidence and act to protect mankind's natural heritage. (Buchanan-Davidson--Wisconsin) W75-12012

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. VI. BIOMASS AND PRODUCTION OF PHYTOPLANKTON,

Polish Academy of Sciences, Warsaw. Inst. of

I. Spodniewska, and A. Hillbricht-Ilkowska. Ekologia Polska, Vol 21, No 32, p 521-532, 1973. 1 fig. 8 tab. 22 ref.

*Productivity, Descriptors: *Biomass, *Phytoplankton, *Fish stocking, Herbivores, Carp, Diatoms, Nannoplankton, Decomposing organic matter, Dinoflagellates, Chlorophyta, Periphyton, Cyanophyta, Photosynthesis. Identifiers: *Lake Warniak(Poland), Bream.

Changes in phytoplankton biomass and production were studied in Lake Warniak, a small pond type lake in Poland, for three years (1967-1969) after introduction of carp and bream. No large differences were observed in phytoplankton development at the various sampling sites; the observed dif-ferences between sites became smaller in consecutive years. There was a decrease in phytoplankton biomass and production; an increase in the amount of nannoplankton in biomass and production; a decrease in the efficiency of phytoplankton production; an increase in relative photosynthetic ctivity due to the presence of more nannoplankton in the total phytoplankton biomass; and an increase in the destruction of organic matter in con-secutive years. The whole lake became more uniform as shown by smaller differences in phytoplankton biomass, production, and amount of organic matter destruction, possibly due to increased turbidity due to increased fish penetration.
The relative photosynthetic activity of phytoplankton increased due to changes in species composition, but the total phytoplankton production decreased. This increased activity may have been the result of changes in the environment caused by the fish. (Buchanan-Davidson-Wisconsin). W75-12013

GROWTH OF THE GREEN ALGA CODIUM FRAGILE IN A CONNECTICUT ESTUARY. Yale Univ., New Haven, Conn. Dept. of Biology. K. C. Malinowski, and J. Ramus. J Phycol, Vol 9, No 1, p 102-110, 1973.

*Connecticut. *Chlorophyta, *Algae, *Eutrophication, Salinity, Seasonal, Temperature, Nitrogen, Reproduction, Water pollution effects. *Codium-fragile. *Niantic Identifiers: River(Conn), Seaweed.

An in situ comparison of environmental and physiological factors was undertaken in 1971-72 (15 months) in the Niantic River estuary to elucidate some of the important aspects of the growth and development of the seaweed C. fragile. In general, Codium in the estuary has a growing season of from 6-9 mo. Growth increments during this period are relatively constant. Temperature and salinity are the main limiting factors, although low summer concentrations of inorganic N may also be involved. Repoduction by means of swar mers occurs only in late summer or autumn. Codium appears highly adapted to the role of a colonizing species. It not only possesses the capability to occupy the harshest of environments, but also a system of reproductive alternatives which facilitates rapid colonization. The availability of substrate for attachment is the chief factor limiting is spread in this estuarine system.--Copyright 1973, Biological Abstracts, Inc. W75-12051

INFLUENCE OF ENVIRONMENTAL STRESS ON ENUMERATION OF INDICATOR BAC-TERIA FROM NATURAL WATERS, State Univ., Bozeman.

Microbiology.

G. K. Bissonnette, J. J. Jezeski, G. A. McFeters, and D. G. Stuart.

and D. G. Stuart. Applied Microbiology, Vol 29, No 2, p 186-194, 1975. 2 fig, 4 tab, 25 ref. OWRR B-035 MONT(3) and B-040 MONT(2).

Descriptors: *Water injury, *Coliforms, *Stress, *Enteric bacteria, *Bacteria, E. coli, Streptococcus, Cultures, Plant physiology, *Bioindicators, Pollutant identification. Identifiers: *Environmental stress, Injury.

With the aid of membrane filter chambers, it was possible to follow the survival, injury, and recovery characteristics of populations of indicator organisms (Escherichia coli and Streptococcus faecalis) as a function of exposure time in various aquatic environments. It was observed that upon exposure to the aquatic environment a significant proportion of cells lost their ability to produce colonies on a selective medium yet retained this capability on a nutritionally rich, nonselective medium. Discrepancies in colony-forming units between nonselective and selective media indicated that a substantial portion of bacterial cells may become physiologically injured due to the en-vironmental stress imposed by the aquatic environment. The extent of injury was observed to vary considerably among eight different stream environments. It was observed that the injury induced to a population of E. coli during exposure to the aquatic environment could be rapidly repaired in a nutritionally rich, nonselective medium. As the injured cell population was exposed to the rich, nonselective broth, increasing proportions of cells were able to repair themselves so that they became insensitive to inhibitory agents in a selective media. (Jones-Wisconsin) W75-12053

POLLUTION EFFECTS ON SURFACE WATERS AND GROUNDWATERS, (LITERATURE REVIEW),
Hawaii Univ., Honolulu. Dept. of Civil Engineer-

For primary bibliographic entry see Field 5B. W75-12070

ORGANICS, (LITERATURE REVIEW), Drexel Univ., Philadelphia, Pa. Dept. of Environ-mental Engineering and Science. For primary bibliographic entry see Field 5B. W75-12071

EFFECTS OF AERIAL FOREST FERTILIZA-TION WITH UREA PELLETS ON NITROGEN LEVELS IN A MOUNTAIN STREAM, Pacific Northwest Water Lab., Corvallis, Oreg. For primary bibliographic entry see Field 5B.

MINE DRAINAGE ABSTRACTS, A BIBLIOG-RAPHY. 1972 SUPPLEMENT.
Bituminous Coal Research, Inc., Monroeville. Pa. For primary bibliographic entry see Field 5B. W75-12158

OCEAN DUMPING IN THE NEW YORK

BIGHT, National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis For primary bibliographic entry see Field 5B. W75-12172

THE MUSSEL WATCH-A FIRST STEP IN GLOBAL MARINE MONITORING, Scripps Institution of Oceanography, La Jolla, Calif.

For primary bibliographic entry see Field 5B. W75-12187

EFFECT OF BROMEX-50 ON PLANKTON POPULATION IN FISH PONDS, Agricultural Research Organization, Dor (Israel).

Fish and Aquaculture Station.
G. L. Schroeder.
Bamidgeh, Vol 27, No 1, p 3-7, March 1975. 2 fig, 2 tab. 4 ref.

Descriptors: *Plankton, *Primary producers, *Zooplankton, Ponds, *Toxins, *Biomass, *Zooplankton, Ponds, *Toxins, *Bi Phytoplankton, Mortality, Parasitism, parasites. Identifiers: *Lernaea, Bromex-50.

Four fish ponds were treated with Bromex-50 for the eradication of the parasite Lernaea, Plankton concentrations, dissolved oxygen, and pH were monitored prior to and following the Bromex-50 treatment. In moderately and heavily stocked ponds zooplankton decreased from 0.8 mg dry weight per liter to 0.05 mg/l and 0.1 mg/l to 0.05 mg/l respectively. Analysis of the pond water 12 hours after the Bromex treatment revealed no zooplankton activity. At plus 2 days zooplankton activity had returned and at plus 7 to 9 days zooplankton concentrations were similar to pre-Bromex values. No changes related to Bromex were observed in phytoplankton standing stocks, pH or DO. (Katz)

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5 Effects Of Pollution—Group 5C

IMPACT OF INTRACOASTAL WATERWAY MAINTENANCE DREDGING ON A MUD BOT-TOM BENTHOS COMMUNITY.

Skidaway Inst. of Oceanography, Savannah, Ga. R. R. Stickney, and D. Perlmutter. Biological Conservation, Vol 7, No 3, p 211-226, April 1975. 2 fig. 7 tab. 8 ref, append.

Descriptors: *Channels, *Dredging, *Mud, *Benthic Fauna, Habitats, Biological Communities, Methodology, Channel improvement, Succession, Surveys, Growth stages, Water pollution

Identifiers: Hydraulic dredging, Spartina alter-

The effects of hydraulic dredging on the benthic infauna of a mud bottom area were investigated in Georgia in the Atlantic Intracoastal Waterway. Complete displacement of the benthic community compete displacement of the benuite community was caused by dredging; however, the community began to recover within a month following the cessation of dredging. Within two months the diversity and species composition of the dredged channel were similar to that of a control area and little change in sediment composition resulted. Thus, no apparent limitation was imposed on the normal benthic population by habitat alteration. Recolonisation was too rapid to have been caused by the settling of immature or larval stages from the water column alone. Bank slumping and migra-tion of adult forms have been postulated as other means of recolonisation. (Katz) W75-12189

EXPERIMENTAL DATA FOR ESTABLISHING THE CONTENT OF ALPHA, ALPHA, BETA-TRICHLOROPROPIONIC ACID AND ITS SODI-UM SALTS IN RESERVOIR WATER Meditsinskii Institut, Saratov (USSR). Dept. of

General Hygiene.

O. V. Yes'kina.

Available from the National Technical Information Service, Springfield, Va 22161, as AD/A-006

994, \$3.25 in paper copy, \$2.25 in microfiche.

Translation AD/A-006 094. Trans from Aktual.

Vopr. Teor., Praktich, Medits, 1970.

Descriptors: *Herbicides, Organic compounds, Rodents, Reservoirs, Animal Physiology, *Salts, Environmental effects, Sodium compounds, Analytical tests, Sewage, Water quality, *Acids, *Water pollution effects, *Organic acids, Toxicity, Lebstifiars: Identifiers: Alpha, Alpha, Beta-Trichloropropionic Acid, Tissue analysis, Bioac-cumulation, LD-50, Sublethal effects.

The toxicity of the widely used herbicide alpha, alpha, beta-trichloropropionic acid and its sodium salt was studied on mice, rats and rabbits. The average LD-50 was 4500-7000 mg/kg. When doses equal to 1/5 and 1/20 LD-50 were given daily for 20 days, not one animal died, but the animals who had received 1/5 LD-50 put on weight the slowest, had a decrease in SH-groups in the blood serum, an increase in the weight coefficient for the liver, kidneys and an increase in the vitamin C content of the adrenals. (Katz) W75-12190

MICROBIOLOGY OF A FORMER DREDGE SPOIL DISPOSAL AREA, Northeast Nuclear Energy Co., Waterford, Conn. Millstone Environmental Lab. L. E. Birgolay, and J. D. Bush.

L. E. Bireley, and J. D. Buck. Marine Pollution Bulletin, Vol 6, No 7, p 107-110, July 1975. 4 fig, 3 tab, 34 ref.

Descriptors: *Bacteria, *Coliforms, *Aerobic bacteria, *Enteric bacteria, *Sewage bacteria, *Dredging, Wastes, *Sewage, *Microbiology, Bioindicators, Water pollution sources, Bottom sampling, Speciation, Biochemistry, Water, Sediments, Sampling, Environmental effects, Primary productivity productivity.
Identifiers: *Dredge spoil disposal si
*Heterotrophic bacteria, Comparative analysis.

A microbiological study of an historically active dredge spoil disposal area in Long Island Sound showed no obvious long-term effects on the bacterial populations of water and sediment. Observations were made 4 years after the last deposition of dredge spoils. Determinations included total and faecal coliforms and numbers, hydrolytic types, and taxonomic groupings of 'total' heterotrophic bacteria. Comparisons with water and sediment from other areas of the sound indicated that the dump site was not bacteriologically unique. (Katz) W75-12191

FILTRATION OF NEUTRAL RED BY FRESH WATER CLAMS IN AEROBIC AND HYPOXIC CONDITIONS,

Kalamazoo Coll., Mich, Dept. of Biology.

D. G. Badman.

Comparative Biochemical Physiology, Vol 51A, August 1975, 741-744, 1 fig, 1 tab, 10 ref.

Descriptors: *Molluscs, *Clams, *Animal physiology, *Biochemistry, *Filtration, *Oxygen requirements, Analytical techniques, Laboratory tests. Aerobic conditions.

ldentifiers: *Fresh water clams, Neutral red,
*Hypoxic condition, *Anaerobiosis, Valve activity (Clams), Elliptio dilatatus, Pleurobema coccine-

Rates of filtration of neutral red by aerobic and hypoxic fresh water clams were measured to determine the role of previously observed hypoxic intense valve activity. Aerobic clams filtered readily, showing a mean initial rate of 0.051 plus or minus 0.008 mg/min (Actinonaias carinata), 0.025 plus or minus 0.006 mg/min (Elliptio dialatatus) and 0.019 plus or minus 0.006 mg/min (Pleurobema coccineum). The hypoxic rate was reduced to 0.011 plus or minus 0.006 mg/min (E. dilatatus) and 0.016 plus or minus 0.006 mg/min (E. dilatatus) and 0.016 plus or minus 0.006 mg/min (E. dilatatus) and 0.016 plus or minus 0.006 mg/min (D. dilatatus) and 0.016 plus or minus 0.006 mg/min (P. coccineum), even though measurements were taken only when individuals had active valves and open siphons. It is concluded that the hypoxic intense valve activity does not have the replenishment of tissue oxygen as a major function. (Katz)
W75-12192

DETECTION OF POLLUTANTS BY FISH

For primary bibliographic entry see Field 5A. W75-12193

NITROGEN, PHOSPHORUS, AND EUTROPHICATION IN THE COASTAL MARINE ENVIRONMENT,

Woods Hole Oceanographic Institution, Mass. J. H. Ryther, and W. M. Dunstan. Science, Vol 171, p 1008-1013, March 1971. 6 p, 7

fig. 31 ref.

Descriptors: *Bioassay, *Algae, *Nitrogen, *Phosphates, *Eutrophication, Water pollution efrnosphates, 'Eutrophication, water poliution effects, Coastal marshes, Coasts, Detergents, Ammonia, Nitrogen compounds, Phosphorus, Aquatic life, Algal control, Aquatic weed control, Control, Chemical analysis, Pollutant identification, Water analysis, Water pollution, Water pollutions

tion sources.
Identifiers: *Coastal marine environment, Coastal waters, Effluent limitations.

The importance of nitrogen in coastal marine waters is discussed. Nitrogen is described as the critical limiting factor to algal growth and eutrophication. Bioassay experiments and the distribution of phosphorus and inorganic nitrogen compel this conclusion. Experiments show that approximately twice the amount of phosphate usable by algae is present. Factors contributing to the surplus include: the low nitrogen to phosphorous ratio in terrigenous contributions containing human waste; and the quicker regeneration of phosphorus, from decomposing organic matter, in contrast to ammonia. In conclusion, the report comments that eutrophication in coastal marine waters is not likely to be retarded by removing phosphates from detergents; and further, replacing phosphorus with nitrogen-containing nitrilotriacetic acid may be even more harmful. (Hoffman-Florida) W75-12236

ARE CHEMICALS USED ALGAE CONTROL BIODEGRADABLE

Wisconsin Univ., Madison.

G. P. Fitzgerald. Water and Sewage Works, Vol 122, No 5, p 82-85, May, 1975. 5 tab, 7 ref.

*Algicides, *Biodegradation, Chemicals, Copper, Silver, Analytical techniques, Environmental effects, Aquatic organisms, Water pollution effects, Algal control. Identifiers: Methyl mercuric choloride

Concern about the use of toxic chemicals to control the growth of nuisance algae has led to a study on the biodegradability of these substances. The simple procedure used for testing various commercial algicides was to apply the initial dosage required to stop the growth of the algae present, reinnoculate with algae, and then observe whether additional algicide was needed to stop the growth of reintroduced algae. If no additional dose was required, this was taken as an indication that the chemical was not biodegraded by the algae. If additional chemical was needed, it was assumed that the initial dose had been biodegraded. Of the products containing copper, silver, mercuric chloride, phenyl mercuric acetate, and quaternary ammonium compounds tested over the last 11 years, all were found to be biodegraded by the treated algae. However, methyl mercuric chloride is not detoxified by the action of treated algae and is not detoxined by the action of treated algae and its use as an algicide would be a threat to the aquatic environment. It is recommended that because methyl mercuric chloride has been determined to be non-biodegradable, all chemicals to be added to aquatic environments should be evaluated. (Orr-FIRL) W75-12325

LIGHT AND ASSIMILATION NUMBER IN A SMALL DESERT, RECHARGED-GROUN WATER POND, Arizona State Univ., Tempe. Dept. of Zoology. DESERT, RECHARGED-GROUND-

For primary bibliographic entry see Field 5A. W75-12326

WATER QUALITY AND SALT WATER INTRU-SION IN THE LOWER NECHES RIVER. Lamar Univ. Beaumont, Tex. Dept. of Biology R. C. Harrel.

The Texas Journal of Science, Vol 26, No 1 and 2, p 107-117, February, 1975. 7 fig, 2 tab, 6 ref.

Descriptors: *Water pollution effects, water intrusion, Saline water barriers, Oil, Mu-nicipal wastes, Irrigation, Water quality, Indicators, Benthic fauna, Texas. Identifiers: *Neches River(Texas).

The water of the lower Neches River is used to supply: a large industrial complex consisting of petrochemical refining and manufacturing, and production of lumber products; municipal water for over 350,000 people; and irrigation for 60,000 acres of rice land. The effects of salt water intrusion, carrying with it toxic and organic waste effluents from the industrialized lower reaches, are discussed. The toxic effects are augmented by the erection of salt water dams(to protect the potable water intake points) which cause a concentration of the salt water and effluents. The effects of salt water intrusion on water quality were determined from physico-chemical data and benthic macroinvertebrate studies: dissolved oxygen and pH decreased below the salt water barrier; alkalinity,

Group 5C-Effects Of Pollution

turbidity, and specific conductance increased below the barrier; the bottom substrate above the barrier was clean fine and coarse sand; below the barrier, the bottom sand was covered with several centimeters of black silt smelling of hydrogen sulfide and oil; density per individual of benthic macroinvertebrates indicated a less stable community structure below the barrier and is indicative of polluted waters; and the particular species collected below the barrier have been previously reported as living in polluted waters while those above the barrier were typically clean water species. (Orr-FIRL) W75-12327

TOXICITY OF AOUATIC ORGANISMS CAUSED BY CHLORINATION.

International Pacific Salmon Fisheries Commission, New Westminster (British Columbia), Environmental Conservation Div.

For primary bibliographic entry see Field 5D.

5D. Waste Treatment Processes

INDIVIDUAL HOME WASTEWATER CHARAC-TERIZATION AND TREATMENT, Colorado Univ., Boulder. Dept. of Civil and En-

vironmental Engineering

E. R. Bennett, and K. D. Linstedt.

Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 259, \$5.75 in paper copy, \$2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 66, July 1975. 137 p, 27 fig, 38 tab, 52 ref. OWRT A-021-COLO (5). 14-31-0001-5006

Descriptors: *Waste Water treatment, *Waste Descriptors: Waste Water treatment, Waste dientification, *Colorado, *Domestic wastes, Septic tanks, Aerobic treatment, *Water reuse, Water pollution, *Path of pollutants, Water utilization. Identifiers: Gray water treatment, Aerobic home sewage treatment units, Evaporation-Transpiration beds, Water reuse(domestic).

Disposal of wastewater from isolated homes in mountainous and rural locations in Colorado presents unique and difficult problems. The pur-pose of the study was to evaluate the flow and pol-lution patterns from individual homes and to evaluate existing and potential treatment methods. Field evaluation of home wastewater flow and pollutional characteristics was accomplished. The average per capita water use in the home was 44.4 gallons per day; the waste strength was 0.11 lb day of BOD per person. Data for individual fixtures and appliances were obtained with measurement of many pollutional parameters. A brief evaluation of the home treatment methods was accomplished. Laboratory bench scale studies were made to evaluate methods for treatment of the soap related wastes in the home for reuse as toilet flushing water. W75-11852

SPRAY IRRIGATION OF TREATED MU-NICIPAL SEWAGE, British Columbia Univ., Vancouver. Dept. of Civil

W. K. Oldham.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 227-239, 1975. 2 fig, 5 tab, 3 ref.

Descriptors: *Waste water treatment, *Irrigation, *Waste water disposal, *Water reuse, Groundwater, Nutrients, Phosphorus, Nitrogen, Agriculture, Crop response, Alfalfa, *Canada. Identifiers: *Spray irrigation.

Research was conducted to determine a water and nutrient budget for spray irrigation of secondary

effluent from a municipal waste water treatment plant in the Okanagan Valley of British Columbia, Canada. The usefulness and acceptability of the forage crop produced was also considered. The long-term usefulness of such a disposal method at various rates of application was estimated. The application rate (0.32 inches/day) used in irrigating the alfalfa was close to the optimum rate for water and macro-nutrient utilization. Limiting the irrigation period to the alfalfa growing season will produce an ideal phosphorus balance. At the application rate used over the irrigation season, the average annual phosphorus increase in the five-foot deep soil horizon was 0.7 ppm. Other impurities were well absorbed by the soil and their rates of concentration increase were much lower than that for phosphorus. The alfalfa crops grown compared well with similar crops grown using non-waste water irrigation. The amount of impurities released to the groundwater was negligible. (Orr-FIRI) W75-11856

PACKAGE TREATMENT PLANTS AND FAC-

TORS AFFECTING SERVICE, Northern Purification Services Ltd., North Vancouver (British Columbia).

P. H. Martin

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 219-225,

Descriptors: *Waste water treatment, *Sewage treatment, *Domestic wastes, Treatment facilities, *Biological treatment, Design criteria, Corrosion control, *Canada.

Identifiers: *Package plants.

Package plants of less than 20,000 gpd that use biological treatment methods are discussed. Package plants are usually chosen because of economics unsuitability of the conventional septic system, or the unavailability of a conventional mu-nicipal sewage collection service. Improvements in package plants over the last ten years are described. The use of non-corrosive long lived described. The use of non-corrosive long lived materials result in reduced preventative maintenance of the shell, extended life and a guaranteed reuse factor for the product. Concrete technology has produced concrete finishes that are essentially inert if properly applied. Plastic piping, valving and fastenings have aided in minimizing corrosion and easing the disassembly and reas-sembly of components. Control and fail safe systems are now available. Processes to minimize the adverse effects of fluctuating organic and hydraulic loads have been refined. Plant design has become more aesthetically pleasing. Package plants have clearly defined performance limits and cannot be expected to perform outside these limits. The performance of a package plant will be dependent on the quality of the engineering design. Regular trained service or preventative main tenance procedures are a necessity. ()(Orr-FIRL) W75-11857

ALTERNATIVE METHODS OF DISINFEC-TION.

Ontario Ministry of the Environment, Toronto.
Pollution Control Branch.

K. J. Roberts.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 183-193, 1975. 2 fig, 1 tab, 18 ref.

Descriptors: *Disinfection, *Waste water treatment, *Chlorination, *Ozone, Gamma rays, Ultraviolet radiation, Oxidation, Pilot plants.

Identifiers: Chemical oxidation, Chlorine dioxide.

Alternatives to chlorine disinfection of waste water, such as dechlorination, chemical oxidation, ultraviolet and gamma ionizing radiation, are examined. Dechlorination is the removal of all or part of the total chlorine residual through the addition of sulfur dioxide or other sulfur bearing compounds. Chemical oxidation can be accomplished by the application of ozone or chlorine dioxide. Ozone is a powerful oxidizing agent, an efficient disinfectant, and leaves a beneficial dissolved oxdisinfectant, and leaves a beneficial dissolved oxygen residual. The bactericidal efficiency of chlorine dioxide is comparable to that of chlorine in the neutral pH range and increases significantly with pH. Ultraviolet radiation does not appear to be a feasible method for disinfection of waste water because the water to be treated by UV must be free of suspended particles that would act as a shield to keep the electromagnetic waves from actually striking and killing the organisms. A pilot plant study for the disinfection of activated sludge effluent by gamma irradiation is presented in detail. Results show: coliform organisms are the most sensitive to irradiation treatment; good disinfection can be achieved with the application of a dose of 100,000 rads; the disinfecting process is re-liable because the applied radiation is constant and predictable; and, the effluent from the irradiation reactor was nontoxic to fish. Each method of treatment has its own advantages and disadvantages. (Orr-FIRL) W75-11858

NITROGEN REMOVAL FROM MUNICIPAL

WASTEWATER, Du Pont of Canada Ltd., Montreal (Ouebec).

D. C. Climenhage.

Environment Canada Research Report No. 17, (1974). 33 p, 6 fig, 5 tab, 29 ref.

Descriptors: *Waste water treatment, *Biological reatment, *Denitrification, Nitrification, Sewage treatment, Nitrogen cycle, Pilot plants, Biochemical oxygen demand. Identifiers: *Nitrogen removal.

A biological treatment process has been developed to remove nitrogen from industrial waste water. The denitrification stage is first, followed by an extended aeration stage its lifet, rollowed by an extended aeration stage that effects BOD reduction and nitrification. Mixed liquor from the aerated stage is recycled at a high rate to the anaerobic stage where nitrate is denitrified using the sewage as the organic carbon source. The advantage of this process is that the need for carbon addition to the denitrification stage is eliminated. A pilot plant study was performed to test the ef-fectiveness of this process on municipal waste water. The domestic waste water that was to be used as the test substrate had a very low BOD and was therefore mixed with hexamethylene diamine was therefore mixed with hexamethylene diamine and methanol to raise the BOD and organic nitrogen concentration. An overall nitrogen removal efficiency of 85-90% was achieved on a mixture of 25% sewage and 75% chemical additives. The efficiences were based on total nitrogen in the influent and filtered effluent and were achieved with recycle to feed ratios of 1:1 to 1.5:1. About 18% of the pittogen reproval was accounted About 18% of the nitrogen removal was accounted for by recycle to the anaerobic first stage and about 13% was accounted for by cell synthesis. Further experimentation is recommended to con-firm the results of this test using full strength sewage without chemical additives, and to investigate the mechanism of nitrogen removal and the effect of important parameters on nitrogen removal efficiency. (Orr-FIRL) W75-11859

STUDY ON DIRECT RAPID FILTRATION USING REDUCED COAGULANTS, (IN

JAPANESE), S. Tsunoda, and Y. Aoyanagi. Gesuido Kyokai-shi, (Journal of Japan Water Works Association), No. 486, p 2-10, March, 1975.

Descriptors: *Filtration, *Kaolinite, *Suspension, *Waste water treatment, Filters, Sands, Hydrogen ion concentration, *Coagulation, *Suspended Identifiers: Metal ions, Coagulated particles,

The direct filtration of kaolinite suspensions by sand beds was investigated. The coagulant metal ions used in the direct filtration process were hydrolized in water forming various polynuclear complexes. The pH was the most important factor in direct filtration; the particle attachment mechanism was controlled by pH. The kaolinite suspension under certain circumstances showed a preferred orientation on the sand surface. The coagulated particles in pH 4-5 settled into filter pores, and the pressure drop of the filter bed was small. Particles in pH 6-6.5 showed no preferred orientation with respect to the sand surface, and covered the sand particles uniformly. In pH 7-10, the particles settled mainly on sand surfaces already covered with coagulated particles, and pressure drop increased significantly. (Murphy-FIRL)

THE GRAPHICAL HYDROGRAPHS METHOD WITH THE INTERMEDIARY OF STORM
OVERFLOWS AND FLOOD RETENTION
TANKS (DAS GRAFISCHE AFLUSSGANGLINIENVERFAHREN MIT ZWISCHENSCHALTUNG VON RUE UND RB), R. Lautrich.

Wasser und Boden, Vol. 27, No. 5, p 112-115, May, 1975. 8 fig, 1 tab, 7 ref.

Descriptors: *Hydrographs, Rainfall intensity, Pow. Runoff, Rainfall-runoff relationships, *Overflow, *Waste water treatment. Identifiers: *Storm overflow, *Flood retention tanks, Storm overflow basins.

An example of the application of the graphical ru-noff hydrograph method to systems such as storm overflow and flood retention basins is presented. The flood curve gives a true picture of the effects and overlaps of the runoff peaks at different rain intensities. The flow curve, and consequently the runoff curve should be drawn with the computarunnit curve should be drawn with the computation point as a starting point opposite to the flow direction. The compensating effect of several storm overflow basins can be correctly determined by a runoff curve only. (Takacs-FIRL) W75-11861

USE OF PLASTIC PIPE FOR SEWERS, Otay Municipal Water District, Spring Valley, Calif. For primary bibliographic entry see Field 8G. W75-11907

INFLATABLE PLUG CUTS MESS, CLEANUP ON SEWERLINE BYPASS, Robbinsdale Water and Sewer Superintendent's Office, Minn. For primary bibliographic entry see Field 8C. W75-11908

COMBINED WASTEWATER OVERFLOWS, Blume (John A.) and Associates, Engineers, San Francisco, Calif. Francisco, Caur. C. K. Chen, and W. W. Saxton. Journal Water Pollution Control Federation, Vol. 45, No. 3, p 434-448, March, 1973. 13 fig, 3 tab, 11

Descriptors: *Combined sewers, *Analytical techniques, *Overflow, Treatment facilities, Rainfall, Runoff forecasting, Waste water treatment. Identifiers: Storm storage tanks.

In order to meet more stringent pollution control requirements, municipalities have found it necessary to correct problems created by existing com-bined sewer systems which suffer from waste water overflows. Preceding correction, analysis of combined sewer overflow systems must be per-formed and the usual method is based on flow measuring programs at specific overflow points. This method provides accurate results only if the gaging installation is functioning properly. Thus a rational method of analysis has been developed which determines the number, duration, and volume of overflows occurring in a system with various intercepting capacities as well as the capacities of storm storage tanks and overflow treatment facilities required to provide various degrees of overflow reduction. This concept may be adapted to any region provided that rainfall data are available and the percentage of runoff can be determined. (Sandoski-FIRL) W75-11912

A RADIOISOTOPE MONITORING SYSTEM FOR SEWAGE EFFLUENT,

California Univ., Livermore. Lawrence Livermore Lab.

For primary bibliographic entry see Field 5A. W75-11914

DRAINING TELFORD NEW TOWN. For primary bibliographic entry see Field 4A. W75-11917

EUROPEAN DEWATERING SYSTEM AIDS QUEBEC PROJECT, R. L. Consedine.

Engineering and Contract Record, Vol. 86, No. 5, p 80, May, 1973. 2 fig.

Descriptors: *Sewerage, *Groundwater, *Installation, Pumps, Hydrants, Wellpoints, Ex-Descriptors: cavation, *Dewatering, *Canada.
Identifiers: Quebec City(Canada), Groundwater control, Couplings, Pipelaying.

A fast, effective dewatering system is overcoming severe water problems and speeding excavation and pipelaying operations at a major housing project near Quebec City, Canada. The Keller method of groundwater control is used to install sanitary sewers and watermains for Development Iberville at Ville de Belair. To predrain, a series of 2-inch diameter wellpoints have been sunk. The well-points are self-jetting with pressure supplied using either a water hydrant or a special portable jetting pump. Once in position at the desired depth, the wellpoints are connected to a 6-inch diameter header pipeline by flexible hoses. This header line header pipeline by Hexible hoses. This header line runs on the surface to a high-capacity suction and dewatering pump. The main advantage for the method lies with its speed since up to 60 wellpoints can be installed per 10-hour shift. A key reason for the quick installation is the use of Kardan couplings which permit connections to be made without tools in about 10 seconds or less. (Sandsek:FBI) (Sandoski-FIRL) W75-11918

TOUGH DIGGING, TIGHT QUARTERS HAMPER HULL COLLECTOR SEWER JOB, R. L. Consedine.

Engineering and Contract Record, Vol. 86, No. 4, p 42-43, April, 1973. 3 fig.

Descriptors: *Sewers, *Storm drains, Excavation, Trenches, Construction equipment, Construction materials, *Waste water treatment, Canada. Identifiers: Hull, Quebec, Canada.

An \$889.078 contract awarded to Fedex Ltd., in October 1972 consists of placing 1600 feet of 10foot diameter concrete horseshoe storm collector and 36-inch diameter sanitary sewer pipe in open cut to depths of 30-feet between the Maisonneuve and St. Etienne Street intersection in Hull, Quebec. Crews have been hampered by a serious lack of working area. Thus the patented Contact Sheeting system to shore up both sides of the 24foot-wide trench was employed. This system in-volves driving a row of wide flange steel soldier beams along both sides of the proposed excavation, and as the excavation advances, short lengths of heavy timber sheeting are cut and fitted in front of the vertical beams. Equipment to handle the

earth and rock moving operations, consist of three backhoes - plus a dozer, front-end crawler loader, a rubbertired loader, and four tandem dump trucks. The method employed is to operate a 1.25yard backhoe on the floor of the trench and have the unit deposit excavated material off to one side of the machine. From the side of the trench wall and the hydraulic backhoe, the loader moves the material to another backhoe located at the top of the advancing trench. The 2-yard machine in turn reloads the material and dumps it into the tandem trucks. (Sandoski-FIRL) W75-11919

SANITARY SEWER SUSPENDED WITHIN STORM SEWER,

Civil Engineering - ASCE, Vol. 43, No. 5, p 93, May, 1973. 2 fig.

Descriptors: *Sewers, *Storm drains, Pipes, Corrosion control, Conduits, Steel pipes, Concrete pipes, Joints(connections), Waste water treatment, Michigan. Identifiers: Pontiac(Mich), Exfiltration.

A 30-inch corrugated steel sanitary sewer has been suspended from the ceiling of a 9-foot concrete storm sewer, 6400 feet long, in Pontiac, Michigan. With the strom drain serving as the conduit for the sanitary sewer line, substantial cost savings were realized over two separate lines. Both sanitary and storm sewers are new in the project known as the Joslyn Drain. The corrugated steel pipe, with asbestos fibers embedded in its zinc coating, was specified for its high degree of corrosion re-sistance. Tight joints, givng the necessary watertightness, were specified to eliminate exfiltration. In addition to being reasonably light in weight, the steel pipe offers the necessary high beam strength. Inside the pipe, the corrugations are filled to im-prove flow. U-shaped steel bands support the sani-tary sewer pipe with each leg anchored by bolts to the roof of the storm drain. Grouting in the minimal space between the two conduits at each support band ties the sewer structure together and helps it resist end forces. (Sandoski-FIRL) W75-11920

STEEL, CONCRETE FORM SEWER SUPPORT SYSTEM.

Excavating Contractor, Vol. 67, No. 4, p 31, April, 1973. 3 fig.

Descriptors: *Combined sewers, *Storm drains, *Pipes, *Sewerage, Installation, Soil properties, Steel pipes, New York. Identifiers: Bronx(NY).

The installation of sanitary sewer lines and storm drainage was an early priority for Co-op City in Bronx, New York since new owners were moving into their apartments as soon as each building unit was completed. Over 60,000 feet of sanitary lines, force sewer mains, and storm drains were laid in the troublesome loose soil environment. For the force main portion of the sewer network, 20-inch force main portion of the sewer network, 20-inch diameter, 3/8-inch wall spiral-welded steel pipe and fittings were used. The pipe and fittings were made to order. The pipe was treated to a cold coat of coal tar primer and a hot coat of coal tar enamel. Then it was wrapped in fiberglass and given another hot coat of coal tar enamel. A final wrap was made of kraft paper. The pipe has a cement lining approximately 3/8-inch thick. All fabricated elbows and offsets were custom designed to meet site requirements. The fabricated fittings were tested at a minimum of 125 psi. (Sandoski-FIRI.) W75-11921. W75-11921

SUPERPOSITION OF TWO PIPES IN A COM-MON, MIXED SEWER SYSTEM (RECOURS A LA SUPERPOSITION DE DEUX CONDUITES DANS UN RESEAU D'ASSAINISSEMENT UNITAIRE).

A. Burry.
L'Eau, Vol. 68, No. 4, p 173-174, April, 1973. 3 fig.

Group 5D—Waste Treatment Processes

Descriptors: *Sewerage *Combined sewers Separated sewers, Dairy industry, Hospitals, Concrete pipes, Corrosion, Storm runoff, Pipes, Effluents, Treatment facilities, Waste water treat-

Identifiers: Stoneware pipes.

Superposition of two pipes in a common, mixed sewer system in Mulhouse, France is described. The risk of premature corrosion of concrete pipes due to effluents from recently connected hospital and dairy sources prompted their separation from storm runoff in the pipes. The effluents, diluted at a ratio of 1:3, are carried by old, stoneware pipes located at the bottom of the sewer, while runoff has been switched to new concrete pipes of ovoid shape placed above the former. The upper duct discharges to the collector at a given delay caused by a retention basin while the lower duct has direct passage to the old collector. Effluent separation makes it possible to convey all or part of the effluent to a waste water treatment facility. (Takacs-W75-11923

VAPHANK COUNTY CENTER WASTEWATER TREATMENT PLANT.

Suffolk County Dept. of Buildings and Grounds, New York

Consulting Engineer, Vol. 40, No. 6, p 108, June,

Descriptors: *Waste water treatment, *Treatment facilities, Effluents, Aquifers, Recycling, Nitrogen, Flow, Groundwater, Tertiary treatment, York. Identifiers: Yaphank(NY).

The Department of Buildings and Grounds of Suffolk County, N. Y., retained Holzmacher, McLendon and Murrell, P.C., as environmental project consultants for an advanced waste water collection and treatment center to serve a rapidly expanding county governmental center at Yaphank, Suffolk County, New York. Flow characteristics, coupled with severe effluent limitations set up by Suffolk County for discharge to groundwater aquifers, dictated a system utilizing the most recent state-of-the-art processes. For this project waste water renovation for recycle to groundwater with the following characteristics was required: maximum effluent total nitrogen concentration of 10 mg/liter, means of equalizing the flow of in-fluent raw waste, means to handle a 12-hour flow pattern, expansion from 250,000 gpd to an ultimate flow of 1.6 million gpd, and a total nitrogen concentration of 74 mg/liter. The process as designed meets all of the stipulated requirements with regard to effluent quality. Plant operation is simple with no stringent biological controls nor sludge recycle or mixed liquor concentration control required. Maintenance of dissolved oxygen levels is noncritical and control is not required. (Sandoski-FIRL) W75-11924

PROCESS AND AGENTS FOR REMOVAL OF INORGANIC AND ORGANIC MATTER FROM WASTE WATER SYSTEMS,

J. J. Odom, T. P. Shumaker, and D. B. Griffin. Canadian Patent 925,633. Issued May 1, 1973. Patent Office Record, Vol. 100, No. 18, p 1477,

Descriptors: "Waste water treatment, Wastes, *Inorganic compounds, "Organic compounds, *Patents, Detergents, Phenols, Color, Nitrogen compounds, Linear alkylate sulfonates, Alkylbenzene sulfonates, Phosphates.
Identifiers: Phenolic aldehyde resins, Chromates.

A process and agents are provided for removal of both inorganic and organic contaminants from waste water systems. These systems are treated with a phenolic aldehyde resin solubilized by alkali to effect removal of uranium salts and other inorganic salts such as phosphates, chromates, in inorganic pigments; partially or wholly nonbiodegradable detergents such as alkyl benzene sulfonates and linear alkyl sulfonates; and organic materials such as decayed plant life, other nitrogen-bearing substances, phenol and phenol derivatives, and color-bearing matter. (Sandoski-FIRL)

COMPUTER SYSTEM MONITORS BATON ROUGE SEWERS.

For primary bibliographic entry see Field 7C. W75-11927

COMPUTER'S MASTER PLAN SIGNALS SEWER PROBLEMS BEFORE THEY START, Thousand Oaks Utilities Dept., Calif. For primary bibliographic entry see Field 7C. W75-11928

REFRIGERATED SURGE TANK FOR USE WITH AEROBIC SEWAGE DIGESTION WITH AEROBIC SYSTEM, R. J. Fletcher, and R. I. Fletcher.

United States Patent 3,737,382. Issued June 5, 1973. Official Journal of the United States Patent Office, Vol. 911, No. 1, p 208, June 5, 1973.

Descriptors: *Surge tanks. *Sewage, *Refrigeration, *Waste water treatment, *Sewage treatment, Aerobic treatment, Odor, Oxygenation, Patents Identifiers: *Aerobic digestion.

A refrigerated surge tank is used to hold sewage at a reduced temperature and provide an aerobic digestion system with a regulated sewage feed. There is no substantial loss of bio-nutrients nor the generation of offensive odors while the sewage is being held. Preferably the surge tank is also provided with means for oxygenating the sewage. (Sandoski-FIRL) W75-11930

FLEXIBLE JOINT FOR SEWER PIPE.

B. B. Garrett.

United States Patent 3,741,570. Issued June 26, 1973. Official Gazette of the United States Patent Office, Vol 911, No 4, p 1346, June 26, 1973.

*Sewers, Descriptors: *Joints(Connections), *Patents, Clay pipes, Waste water treatment Identifiers: Flexible joints, Gaskets.

A flexible joint for sewer pipes, particularly clay pipes, is described for connecting a bell pipe sec-tion and a spigot pipe section. The bell section has an internal circumferential rib forming a support for the spigot end upon which it may fulcrum during relative tilting movements of the sections. The inner surface of the bell is relieved on one side of the supporting rib, and on the other side is formed with a groove for a sealing gasket of resilient deformable material, such as rubber, the groove having a peripheral space or cavity into which the gasket material can flow or expand under operat-ing applied compression forces. (Sandoski-FIRL) W75-11931

SAFETY INSTALLATION FOR PREVENTING POLLUTION BY PIPELINES, For primary bibliographic entry see Field 8G.

W75-11934

UP-FLOW SEPARATOR,

Sweco, Inc., Los Angeles, Calif. (assignee). T. R. Westfall.

United States Patent 3,737, 038. Issued June 5, 1973. Official Gazette of the United States Patent Office, Vol 911, No 1, p 124, June 5, 1973.

Descriptors: *Combined sewers. *Screens, Flow Separation techniques, *Waste water treatment.

Identifiers: Influent, Flow pattern.

Equipment and methods for screening and concentrating waste water overflow from combined sewer systems are described. Exemplary equipment includes a separator employing a substantially cylindrical rotating screen. Influent is piped upwardly into the equipment and deflected out-wardly toward the inner surface of the screen in a manner to achieve a desired flow rate and flow pattern of the influent into the screen. Means are provided for controlling the flow rate and for suitably directing the influent in a plurality of substantially discrete inclined streams toward the inner surface of the rotating screen. The screen is rotated at a speed to achieve a desired centrifugal force. Effluent passes through the screen to an outlet and the remaining concentrate passes to an outlet. The screen is in the form of a screen cage having a plurality of removable screen panels for facilitating replacement of damaged screens or changing of screen type or mesh size. Cleaning means is provided for directing a cleaning fluid periodically at the screen. The methods disclosed involve the manner in which the influent, effluent, concentrate and backsplash are handled, and the manner in which the influent is screened to achieve a fluid concentrate which is pumpable to other treatment equipment for ultimate disposal. Additionally, a sequence of influent feed and screen cleaning is described. (Sandoski-FIRL) W75-11936

A PRACTICAL PROPORTIONAL WEIR,

Sri Venkateswara Univ., Tirupati (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.

W75-11937

EXPERIMENTS WITH UNCONVENTIONAL

STORM OVERFLOWS,
Loughborough Univ. of Technology (England).
Y. R. Reddy, and J. Pickford. Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 99, No EE3, p 177-185, June, 1973. 6 fig, 5 ref.

Descriptors: *Storm runoff, *Model studies, Siphons, Overflow, Suspended solids, Water pol-lution control, Waste water treatment.

Models of four typical jet siphon type stilling pond storm overflows, the bypass being through an air regulated siphon, were tested. The main objective was to reduce the saturation of the stilling pond with light solids. To obtain a comparison of the performance of different models, several hundred polymer beads of various densities were introduced into the upstream system of the overflow. The efficiency of the storm overflow, defined as the fraction of the solids not discharged through the bypass siphon, was then estimated and the influence of the location of the bypass siphon on the efficiency of the system investigated. (Sandoski-FIRL) W75-11940

THE USE OF STORM TANKS FOR TERTIARY TREATMENT OF SEWAGE, Rotherham Dept. of Water Pollution Control

(England).

J. O'Neill Water Pollution Control, Vol 72, No 1, p 87-90, 1973. 1 fig, 3 tab.

Descriptors: *Tertiary treatment, *Sewage, Effluents, Rainfall, Water levels, Outlets, Weirs, Penstocks, *Waste water treatment, Tanks. Identifiers: Rotherham, England, *Storm sewage In 1963 four storm sewage tanks were constructed at Aldwarke sewage works, Rotherham, England, ach 62 x 15 x 1.67 to 2 meters and equipped with a Mieder scraper and transfer carriage. In time it was found that these tanks were being used less than ten percent of the time, which was a poor return on the capital investment, and that frequent use was causing deterioration of the Mieder scraper and particularly of the electrical control gear and limit switches. It was concluded that the cheapest and most effective way of overcoming the problem would be to keep the tanks filled; final effluent was used for this purpose. The scheme involved pumping the effluent to the tanks. When the sewage flow is less than 3 dwf, the first tank remains empty in readiness to receive the first flush of storm sewage when rainfall occurs. If and when the water level in the first tank reaches 0.3 meters below the sill of the outlet weir, electrodes in the tank actuate the mechanism which opens the penstock between tanks 1 and 2, closes the penstock in the diversion chamber, and stops the Spaans pump. Storm sewage then flows into tanks 2, 3, and 4, mixing with and displacing the final effluent in those tanks. When the rainfall has ceased and the flow has fallen below 3 dwf, all the tanks are desludged using the Mieder scraper and the contents are returned to the works' inlet.

After cleaning, tanks 2, 3, and 4 are brought into use again as tertiary settlement units. (Sandoski-FIRL) W75-11941

SCREEN RETAINER ASSEMBLY, Robertshaw Controls Co, Richmond, Va. For primary bibliographic entry see Field 8C.

HYDRAULIC SEWER PIPELINE CLEANER, O'Brien Mfg. Co., Inc., Chicago, Ill. (assignee). R C Latall United States Patent 3,740,785. Issued June 26, 1973. Official Gazette of the United States Patent Office, Vol 911, No 4, p 1147, June 26, 1973.

Descriptors: *Pipelines, *Cleaning, *Patents, Sewerage, Maintenance, *Waste water treatment. Identifiers: *Hydraulic pipeline cleaner.

A skid-mounted, jet-propelled, hydraulic pipeline cleaner is activated from a stationary high pres-sure water pumping unit connected by a flexible hose. A novel skid arrangement of extreme rigidihose. A lover shall arrangement of extreme figure to a saming either a propelling position or a tool flushing position, and a jet propulsion system which is so designed that the jets produced thereby discharge directly into the pipeline void and do not impinge against any portion of the pipeline cleaner as a whole so that no retarding in-fluence is offered to the free forward motion of the cleaner, constitute the salient features of this device. (Sandoski-FIRL) W75-11944

LAYING A MAIN SEWER IN THE RESERVA-TION AREA OF THE ST. POELTEN WATER-WORKS (VERLEGUNG EINES ABWASSER-SAMMLERS IM SCHUTZ- UND SCHOEN-GEBLET DES WASSERWERKES ST. POEL-TEN)., R. Kaliwoda

Gas/Wasser/Waerme, Vol 27, No 2, p 31-33, 1973.

Descriptors: *Treatment facilities, *Sewers, Pipes, Sewage, Joints(Connections), Waste water Identifiers: Austria, Traisen River.

All communities along the presently polluted Traisen River from Wilhelmsburg to the Danube in Austria, have voted to build a new sewage treatment plant and a trunk sewer, since the existing facilities at St. Poelten are inadequate and the

community desires to make the Traisen a bathing river again. The sewer, now under construction, passes the waterworks areas using wells 6 to 7 meters deep with part below groundwater level and discharges at a new sewage treatment plant on the Danube. The sewer pipe, egg-shaped, with a maximum cross sectional area of 2.4 x 2.4 meters, is being built of pre-fabricated sections with specially sealed joints using putty with a tin strip to ensure perfect tightness. (Holz-FIRL) W75-11947

FAIRFAX GOES FOR AWT.

Fairfax County Wastewater System, Va. Water and Wastes Engineering, Vol 10, No 3, p 38-39. March, 1973, 1 fig.

Descriptors: *Treatment facilities, *Sewers, *Waste water treatment, Filtration, Chlorination, Filters, Biochemical oxygen demand, Nutrient removal, Potomac River, Virginia, *Tertiary treat-

Identifiers: Fairfax County(Va).

The Fairfax County, Virginia, Wastewater System consists of over 1400 miles of sanitary sewer lines, 32 pumping stations, and nine treatment plants. The total waste water flow in the county is approximately 50 mgd, of which 33 to 35 mgd is treated by county plants. In July 1970, Fairfax County embarked on a major sewer improvement program with the objective of reducing the total pounds of BOD5 discharged to the Potomac river. As a result of investigations, three treatment plants will be taken out of operation and major emphasis placed on expansion and additions of advanced treatment processes at the Lower Potomac Plant, one of four major facilities. Advanced Wastewater Treatment (AWT) facilities to be installed during 1973-1974 at the Lower Potomac Water Pollution Control Plant the Lower Potomac Water Pollution Control Plant will have an average daily capacity of 36 mgd and a peak flow rate of 68 mgd. Based on raw sewage concentrations of BOD5, phosphorus, and nitrogen of 225 mg/liter, 15 mg/liter, and 50 mg/liter respectively, the AWT facilities are designed for overall treatment plant removal efficiencies as follows: BOD5 - 98.3%, phosphorus - 98.7%, and nitrogen - 98%. The AWT process consists of the following: chemical treatment with calcium of secondary effluent in solids contact treatment of the process of the following contact treatment with calcium of secondary effluent in solids contact treatment with calcium of secondary effluent in solids contact treatment. cium of secondary effluent in solids contact treatment tanks; recarbonation in two stages with inter-mediate settling; filtration on granular multi-media filters to assure removal of unsettled phosphorus precipitates; and, breakpoint chlorination. precipitates; ar (Sandoski-FIRL) W75-11950

SEWER SYSTEM EVALUATION AND REHA-BILITATION COST ESTIMATES, For primary bibliographic entry see Field 6C. W75-11951

EFFICIENCY OF MEASURES FOR THE SANL EFFICIENCY OF MEASURES FOR THE SANI-TARY PROTECTION OF SURFACE WATERS IN THE REGION OF CHEMICAL INDUSTRY ENTERPRISES, (IN RUSSIAN), Gorkovskii Meditsinskii Institut (USSR). For primary bibliographic entry see Field 5G. W75-11977

HYGIENIC EFFECTIVENESS OF MEASURES FOR TREATING THE INDUSTRIAL WASTE-WATERS OF THE KONAKOVO STATE RE-GIONAL ELECTRIC POWER PLANT, (IN RUS-SIAN),

Sanitary Epidemiology Station, Konakovo V. K. Boichenko.

Gig Sanit, Vol 4, p 98-100, 1974.

Descriptors: *Waste water treatment, Public health, Industrial wastes, Electric powerplants, Oil pollution, Treatment facilities, Reservoirs. Identifiers: *Konakovo(USSR). Investigations to determine the hygienic effectiveness of treating the wastewaters of the Konakovo state (USSR) regional electric power plant, operating on fuel oil and discharging, after treatment, wastewaters contaminated mainly with petroleum products from the drainage system of the generator room into the Ivankovo reservoir on the Volga. showed that the plants for treating the oil-containing effluents deserve a favorable evaluation. The treatment plants are effective and protect the reservoir against pollution by petroleum products.—Copyright 1975, Biological Abstracts, Inc. W75-11984.

FILTER PRESS, PARTICULARLY FOR DE-WATERING SLUDGE IN SEWAGE TREAT-MENT PLANTS.

A. Bahr. US Patent No 3,896,030, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 4, p 1386, July 22, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water pollution con-*Water polition destinate, vital properties, Filtration, *Sewage sludge treatment, Filters, Dewatering, Equipment.

Identifiers: *Filter presses.

A filter press for dewatering sludge in sewage treatment plants is described. It is comprised of two endless filter belts that retain the sludge between them. The two filter belts circulate simultaneously and are guided in concentric paths around a rotary drum against which they are held by adjustable pressure rollers so that the liquid is squeezed out of the sludge. The dewatering takes place in a sequence of five stages, the material being worked in each stage in a manner suited to its condition on leaving the previous stage. In the first stage the material, spread out over the surface of the first filter belt, is allowed to drain under gravity without the application of pressure. This is followed by a vibration stage, after which the material enters the wedge-shaped feed inlet and then passes along the horizontal pressure section. finally the material is kneaded and pressed, between the filter belts, on its way around the asynchronous rotary roller cage. The raw material is assumed to be a watery sludge capable of flowing very easily. On its way through the press the material gradually loses water and becomes stiffer. Finally it is pressed to form a hard filter cake and kneaded to remove residual water. The more intense the kneading action the less water remains in the final hard filter cake. (Sinha-OEIS)

RECOVERING PROTEINS FROM WASTE

WATER, Secretary of Agriculture, Washington, D.C. (assignee) J. W. Finley.

US Patent No 3,898,160, 5 p, 7 ref; Official Gazette of the United States Patent Office, Vol 937, No 1, p 202, August 5, 1975.

Descriptors: "Patents, "Waste water treatment, "Water pollution treatment, "Water pollution control, Water quality control, Water purification, Separation techniques, Ion exchange, Proteins, Industrial wastes, Effluents.

A method is described for removing proteins, starch, and other materials from proteinaceous waste water thereby producing both an effluent capable of disposal into municipal waste treatment systems or waterways and a solid ferric-protein-phosphate complex. The complex is susceptible to facile recovery of the valuable proteins contained in it. The process is comprised of: adding to the proteinaceous waste water an alkali metal molecularly-dehydrated phosphate until the con-centration is 0.0001 M to 0.1 M and a source of ferric ions until the concentration is 0.001 M to 0.1 M; precipitating a ferric-protein-phosphate complex and avoiding precipitation of a protein-phosphate

Group 5D—Waste Treatment Processes

complex by raising the pH of the so-treated waste to 7.0; and separating the effluent from the ferricprotein-phosphate complex precipitate. (Sinha-OFIS) W75-12057

FLOCCULATING AGENTS,

Allied Colloids Ltd., Bradford (England).

R. Field, and G. Smalley. US Patent No 3,897,333, 6 p, 7 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 5, p 1834, July 29, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, *Flocculation, *Separation techniques, Sludge treatment, Dewatering, Biological degradation. Identifiers: Paper mill effluents.

A method is disclosed in which an organic suspension selected from raw sewage sludges and sludges obtained by biological degradation is flocculated by adding an aqueous solution of a polymer to the suspension. The water soluble polymers characterized by high molecular weight contain a substantial proportion of recurring quaternised aminomethyl acrylamide or methacrylamide groups. While these polymers can be used to assist in the dewatering of a wide variety of suspensions they show the greates advantage on sludges of organic matter which are proteinaceous or cellulosic in origin or which have been obtained by biological degradation of such matter. (Sinha-OEIS) W75-12058

PROCESS AND APPARATUS FOR RECOVERING CLEAN WATER AND SOLIDS FROM DILUTE, AQUEOUS, SOLIDS CONTAINING SOLUTIONS OR DISPERSIONS,

Hanover Research Corp., East Hanover, N.J.

(assignee).
C. Greenfield, R. E. Casparian, and A. J. Bonanno. US Patent, No 3,898,134, 9 p, 2 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 937, No 1, p 194-195, August 5, 1975.

Descriptors: *Waste water treatment, *Patents, *Water pollution control, *Water purification, Water quality control, *Evaporation, Dehydration. *Condensation. Separation techniques, Heat transfer, Solid wastes, Equip-

A process and apparatus are described for recovering clean water and essentially dry solids from dilute aqueous solids. A dilute stream of aqueous solids is concentrated by heat evapora-tion and the evaporated water is condensed and recovered. The concentrated aqueous solids are mixed with relatively non-volatile fluidizing oil and subjected to dehydration by heat evaporation. The steam formed in the dehydration step is used to supply heat for the concentration step. The solids are separated from the fluidizing oil and recovered in an essentially dry state while the fluidizing oil is recycled. If desired, a light, relatively volatile oil may be mixed with the dilute aqueous solids to prevent scaling and fouling in the concentration evaporator. (Sinha-OEIS) W75-12059

SINGLE BASIN AERATED SEWAGE LAGOON WITH SPRING TIME INTENSIFIED AERA-

Atara Corp., Montreal (Canada). (assignee).

National Corp., Monited (Canada), (assignee).

D. S. Murphy.

US Patent No 3,897,334, 4 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 935, No 5, p 1834-1835, July 29, 1975.

Descriptors: "Patents, "Waste water treatment, "Sewage treatment, "Aeration, Water pollution treatment, Aerated lagoons, Seasonal, Tempera-ture control.

An aerated sewage lagoon has aerators placed densely near the inflow, then gradually less densely proceeding towards the outflow and then densely placed again and finally an area of no aeration. The aerators can be shut off so that in spring there is a second high intensity area to cope with the suddenly increased demand due to winter dormancy In summer the high intensity aeration is followed by an area over which the aeration continues but at gradually reduced intensity as the sewage moves downstream to the outflow. In winter aerators nearer the outflow can be shut off entirely. (Sinha-OFIS) W75-12060

METHOD OF TREATING SEWAGE ENHANCE AEROBIC DECOMPOSITION, K. A. Digney, and A. P. Gallauresi.

US Patent No 3,896,027, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 936, No 4, p 1385, July 22, 1975.

Descriptors: *Patents, *Waste water treatment, *Aerobic *Sewage treatment, *Aeration, Water pollution treatment, Dissolved oxygen, Aerobic bacteria, Domestic wastes. Identifiers: *Aerobic decomposition

The method described increases the level of air or other gas entrained or dissolved in a liquid. The principal application is to enhance aerobic decomposition in sewage by recirculation through a pump where a high level of dissolved oxygen is maintained by mixing atmospheric air into the sewage as it passes through the pump. A hollow shaft, which may conveniently comprise the pump impeller drive shaft, extends from an air intake opening above the sewage level to communicate with the hollow interior of the impeller blades. The with the holious interior of the impelier blades. I he air is discharged through openings preferably at or near the tips of the blades, thereby entering the stream of sewage passing through the pump at the point of highest velocity. Oxygen in the air is ultimately mixed and retained in the sewage to stimulate bacterial activity. (Sinha-OEIS) W75-12061

AEROBIC SEWAGE TREATMENT SYSTEM, Coate Burial Vault, Inc., West Milton, Ohio.

K I Yost

US Patent No 3,879,285, 7 p, 12 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 933, No 4, p 1741, April 22, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Acration, *Aerobic treatment, Domestic wastes, Septic tanks, Anaerobic bacteria, Biodegradation.

Sewage water is directed into an enclosed generally circular shallow tank to expose a large surface area of the sewage water per unit volume. Air is circulated over the surface of the sewage water in a generally circular direction to effect horizontal circulation of the sewage water within the tank and diffusion of the air into the liquid. The water treated in the first aerobic tank is directed from a center outlet in the first tank into a similarly constructed second tank which also provides for horizontal circulation of the treated water and difflusion of the air in response to a generally circular flow of air. The air flow within each tank is produced by connecting the air outlet of the tank to a chimney which projects upward adjacent the outer wall of the residence and creates a natural draft. In another embodiment, the horizontal air flow is produced by a number of circumferentially spaced air conduits which slope downward towards the surface of the sewage water and are connected to an air supply pump. (Sinha-OEIS)

REMODELLING AT NORWICH.

The Consulting Engineer, Vol. 39, No. 5, p 30-31, May, 1975.

Descriptors: *Treatment facilities, *Waste water treatment, Filtration, Activated sludge, Digestion, Aeration, Automatic control, Butterfly valves, Methane, Sludge disposal.

Identifiers: Norwich(England), River Yare, Flow

The Norwich, Great Britain, sewage treatment plant is currently being remodelled. Integration of the existing plant and the new extensions will provide four parallel treatment streams. In two of the parallel systems, sewage will be treated by biological filtration and activated sludge. The other two parallel systems will process sludge by digestion and pressure filtration. A new inlet works com-prised of main flow measuring facilities, duplicate rotating fine drum screens, and duplicate detritors to deal with the whole flow has been constructed. The new activated sludge plant has four radialflow primary settlement tanks and six diffused-air aeration channels. It uses magnetic flow meters and butterfly valves so automatic control can be employed to control the process. The effluent passes to four final radial-flow settlement tanks before discharge into the River Yare. The present sludge digestion system is also being modified.

The site services have also been extended. Methane produced by the digestion system is used as the primary fuel for the new boilers. (Dean-FIRL) W75-12065

OKLAHOMA PLANS AHEAD FOR WASTE-WATER REUSE, Benhan-Blair and Affiliates, Inc., Oklahoma City,

D. B. Benham, L. C. Fountaine, and P. Brune The American City, Vol. 90, No. 7, p 34-35, July,

Descriptors: *Waste water treatment, *Treatment facilities, Tertiary treatment, Sewage treatment, Nutrient removal, Filtration, Trickling filters, Nitrification, Dewatering, Incineration, Chlorination, Water reuse, Water quality standards. Identifiers: Effluent standards

A new municipal waste water treatment facility in Lawton, Oklahoma, has been designed to meet state effluent criteria with less than 15.0 mg/liter BOD21 and phosphorus concentrations under 1.0 mg/liter. Resultant water of this high quality will be purchased by the electric utility serving the area for cooling use in the generation of electric power. Within the facility, raw sewage will pass through a set of three mechanically-cleaned bar screens for solids removal. Preaeration tanks will operate with a detention time of 58 minutes to provide flocculating action, enhancing the removal of ss in primary tanks, and introducing some dissolved oxygen. Three FMC primary settling tanks will be included, with space allowed for a fourth. Secondary treatment will consist of two steps: carbonaceous treatment with plastic media trickling filters; and nitrification by the activated sludge process. Final clarifiers will remove biological sludge formed from the nitrification tank, using suction type sludge removers rather than conventional scrapers. A tertiary stage will be employed to remove phosphorus from the waste water by chemical precipitation using lime, alum, and coagulant-aid polymers. After chemical phosphorus removal, two-stage recarbonation with intermediate settling filtration through sand-anthracite filter beds, and final chlorination disinfection will be accomplished. Sludge from the primary and secondary processes will be dewatered and incinerated; sludge from phosphorus removal will be thickened and stored on site for periodic removal. (Kramer-FIRL) W75-12066

VIRUS REMOVALS IN TRICKLING FILTER PLANTS,

V. R. Sherman, K. Kawata, V. P. Olivieri, and J. D. Naparstek.

Water and Sewage Works, Reference Numbr, p 36, 39-40, 42, 44, April 30, 1975. 2 fig, 4 tab., 19 ref.

Descriptors: *Trickling filters, *Viruses, *Pollutant identification, *Waste water treatment, Chlorination, Treatment facilities, Recreation

Identifiers: *Viral removal.

A goal has been suggested of no more than one infectious virus particle per 10 gallons of receiving water for waters used for contact recreation. Literature on the number of viruses found in waste water and on viral removal in sewage treatment gives conflicting information. An experiment was performed in order to assess viral removal efficiencies in two conventional trickling filter plants in Maryland. Plant capacities were 2.5 mgd and 1.5 mgd. The f2 bacterial virus was used as seed; plants were seeded to a high titer so that it would be possible to observe up to 99.999% removal efficiency. Little virus removal, as expected, occurred in the preliminary treatment units. In the primary sedimentation basins of the two plants, average virus removals were 32.2 and 37.1 percent. Through the trickling filter beds, average removal efficiencies were 18.9 and 9.0 percent. In the secondary sedimentation basins, average virus removals were 30.1 and 28.4 percent. Consistent virus removal was achieved with chlorination, even when aqueous chlorine was simply introduced at the head of the chlorine contact basin through a diffuser. The chlorine contact units had average virus reductions of 60.7% and 59.4%. Overall virus reduction was 88.6% and 85.2%. Thus, to meet the suggested goal of one virus particle per ten gallons, a greater efficiency in the dis-infection process must be accomplished. (Kramer-FIRI) W75-12068

WATER-TREATMENT SLUDGE FILTRATION

STUDIES, Auburn Univ., Ala. Dept. of Civil Engineering. F. C. Hawkins, J. F. Judkins, Jr., and J. M. Morgan.

Journal of the American Water Works Association, Vol. 66, No. 11, p 653-658, November, 1974. 4 fig., 3 tab., 37 ref. OWRT A-024-ALA(3).

Descriptors: *Sludge treatment, *Groundwater, *Surface water, *Filtration, *Water treatment, *Sludge disposal, Alum, Purification, Dewatering, Waste disposal, *Waste water treatment.

Sludge results from the treatment of water impurities from groundwater and from surface water. This sludge must be disposed of properly. By reducing the volume of sludge, disposal may be accomplished more easily. The results of previous studies on the effects of coagulant dosage, magnesium hardness and calcium hardness on specific resistance are detailed. It was concluded that: specific resistance decreases with increasing solids concentration for alum sludge and becomes relatively constant at high solids concentration; the recycle of preformed aluminum-sulfate sludge can produce a more filterable sludge during the coagulation process; and the alum dosage yielding the sludge with minimum specific resistance corresponds approximately to the optimum dosage determined by jar test. Surface water is conven-tionally treated by alum to remove impurities such as clay, silt, and bacteria. Groundwater may contain hardness-causing minerals, which must be removed by lime-soda softening, before it may be put to domestic use. Treatment of the sludges, such as dewatering, and subsequent disposal is summarized. (Prague-FIRL) w75-12069

ANAEROBIC PROCESSES, (LITERATURE REVIEW),

Institute of Gas Technology, Chicago, Ill. S. Ghosh, and J. R. Conrad. Journal Water Pollution Control Federation, Vol 47, No 6, p 1278-1805, June, 1975.

Descriptors: *Waste water treatment, *Anaerobic conditions, *Anaerobic digestion, Bacteria, Thermodynamics, Dentification, Microbial degrada-tion, Reviews, Fermentation, Methane bacteria, Organic wastes, Industrial wastes, Municipal wastes, 'Bibliographies.

A literature review on the subject of anaerobic processes has been prepared. Some of the many studies included: observation of pathways of glu tamate fermentation; detection of Na as an obligate growth requirement of several strains of common rumen bacteria; degradation of various organochlorine and organophosphorus insecti-cides in flooded soils; review of thermodynamics, pathways, and mechanisms of anaerobic fermen-tation and anaerobic sulfate reduction by bacteria present in marine sediments; effect of facultative growth on the redox potential of the microbial cul-tures; and study of factors affecting biological dentrification of waste water by pure cultures. It was suggested that more research be conducted on the fundamental microbiology and mechanism of the energy-yielding, hydrolytic, and gas-forming processes in anaerobic waste fermentation. Many investigations describe the role of anaerobic denitrification for nitrogen removal in soil strata used for the treatment and/or final disposal of applied wastes. Design and operation of digestion tanks and related equipment are outlined. Com-parisons were also made between several sludge parisons were also made between several studge stabilization systems. Specific applications of anaerobic digestion are detailed, such as for food processing wastes, textile wastes, agriculture and livestock wastes, muncipal solid wastes, and landfill leachate treatment. Additionally, the potential for energy reclamation by anaerobic bioconversion of all types of organic wastes to CH4 is under serious consideration. (Kramer-FIRL) W75-12074

SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL, (LITERATURE REVIEW), Delaware Univ., Newark. Dept. of Civil Engineer-

Journal Water Pollution Control Federation, Vol. 47, No. 6, p. 1306-1323, June, 1975. 255 ref.

Descriptors: *Reviews, *Waste disposal, *Sludge treatment, *Sludge disposal, Reuse, Public health, Toxicity, Heavy metals, Dewatering, Ultimate disposal, Simulation analysis, Incincration, *Waste water treatment, *Bibliographies.

Identifiers: Sludge conditioning, Ocean dumping.

A review of recent literature discusses treatment, utilization, and disposal of sludge. Recycling and landspreading procedures must consider public health and safety before new methods of sludge management will gain public acceptance. Sludge properties, such as viscosity, rate of solubilization of carbohydrates, and chemical composition, have been measured. Recovery of potentially valuable waste constituents, which might also be toxic, is suggested. Of particular interest is heavy metals, and the possibility of recovery by solvent extraction, ion exchange, reverse osmosis, electrochemi-cal methods, adsorption, or complex formation with polyelectrolytes. Water treatment plant alum sludge handling presents another set of alterna-tives. Sludge conditioning by chemicals and by polyelectrolytes has been investigated. The effect of thickener size on the cost effectiveness of other sludge treatment processes was reported. Sludge dewatering processes were also reviewed, with simulation models and pilot scale tests. Incineration, wet oxidation, and heat drying are viable solutions for disposal in some situations. Reclama-tion of sludges as fuels is currently under study. Types of ultimate disposal include the controversial ocean dump practices, liquid sludge application of agricultural land, trenching, heat drying and sale as fertilizer, and application to abandoned strip mines. Ecological impact of application must be considered, particularly the sources, fate and effects of trace elements in sludges, when applied to soils. (Kramer-FIRL) W75-12075

WASTEWATER COLLECTION, (LITERATURE

REVIEW), Nottingham (H.D.) and Associates, Inc., McLean,

T. Singh.

Journal of Water Pollution Control Federation, Vol 47, No 6, p 1335-1338, June, 1975. 41 ref.

Descriptors: *Reviews, *Waste water treatment, *Sewers, *Sewerage, *Sewage treatment, Outfall sewers, Maintenance, Combined sewers, Monitoring, Infiltration, Inspection, Inflow, Plastic pipes, Linear programming, *Bibliographies. Identifiers: Television inspection, Sewer monitor-

ing, Waste water collection.

A review of current literature on waste water collection systems is given. Sewer design was stu-died, and use of lower per capita flows and a design period of 25 years rather than 50 years were recommended. Models to optimize drainage networks based on linear programming have been developed. Construction details of long outfall seweres are outlined. Combined sanitary and storm sewer plans, aligned by laser light, are also described. Flow smoothing in sanitary sewers has been investigated; holding basins are meant as a supplemental tool rather than a replacement for the conventional gravity system. The use of materials such as polyethylene pipes was also discussed. Infiltration/inflow problems are major areas of concern. Sewer monitoring methods and measuring devices have been tested. Smoke detection of leaks and surface flows has been imple-mented as has closed circuit TV for sewer inspection. Sewer maintenance, repair, and cleaning are areas of neglect. Attention should be given to preventive maintenance, such as regular hydraulic cleaning, and rehabilitation by slip-lining with ultra high molecular weight polyethylene pipe in the cases of deteriorating concrete pipes. (Kramer-FIRL) W75-12076

THE EFFECT OF LEGISLATION OF THE FU-TURE USE OF WATER IN THE LEATHER IN-DUSTRY.

Pollution Research Lab., Stevenage Water (England). D. A. Bailey

Journal of the Society of Leather Technologists and Chemists, Vol. 57, No. 1, p. 5-12, 1973. 4 fig, 4

Descriptors: *Water conservation, *Tannery wastes, Waste water treatment, Standards, Europe, Legislation, Industrial wastes, Sludge disposal, Costs, Water reuse.
Identifiers: *England, *Leather industry.

As the scarcity of water in England and Wales increases its value and in anticipation of stricter standards for effluent disposal by the Region Water Authorities, recommendations are made to the leather tanning industry for water conservation, re-use, and waste treatment. While new water is unlikely to increase production costs, waste effluent disposal costs will have a pronounced effect on production. It is suggested that the industry reduce the total throughput of water by better housekeeping, alteration of processes to use less water, separate cleaner fractions of the waste for direct re-use without treatment, and recycle after complete or partial treat-ment. Smaller volumes of concentrated wastes would facilitate the application of advanced treat-

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ment techniques, such as high-rate biological systems, and this industry's under-exploited, chemical precipitation. Several methods are proposed to reduce water usage. The industry as a whole should establish the optimum water quantity requirements for each state of processing and set target figures at which to aim. Minimum water quality requirements must also be determined for each process. This information will prove valuable if supplies of cheaper second-grade water are made available, inasmuch as in some instances good quality sewage effluent is used industrially. Wisconsin) W75-12112

COAL MINE DRAINAGE POLLUTION-1973, Pennsylvania State Univ., University Park. Mine Drainage Research Section.
For primary bibliographic entry see Field 5G. W75-12114

BIO-OXIDATION PROCESS SAVES H20. Sun Oil Co., Toledo, Ohio. E. F. Mohler, and L. T. Clere. Hydrocarbon Processing, Vol. 52, No. 1, p. 84-88, 1973. 1 fig, 9 tab, 10 ref.

Descriptors: *Waste water treatment, *Reclaimed water, *Biological treatment, *Oil, Cooling towers, Cooling water, Industrial wastes, Sulfur, Phenols, *Oxidation. Identifiers: Oil refineries, Hydrocarbons, *Bio-ox-

This process successfully handles oil refinery waste water and conserves fresh water. Water consumption is 214 gallons per barrel (gpb) of crude oil on the national average compared to 28 gallons with this system, and consumption has been further reduced to as little as 17 gpb of crude. The process has evolved from experiments in the Toledo refinery of Sun Oil Company based on the use of cooling towers to provide bio-oxidation of phenolic materials while using the waters for conventional equipment process cooling. The mechanism, design, operation and maintenance data are given. Over 90% of the reaction occurs during the fall through the tower structure. The balance of bio-oxidation is carried out in the cooling tower basin before the water is pumped in the circulating system. Over-all removal exceeds 99.9%. Upflow sand filtration allowed the establishment of a high-solids loading which extends the operating cycle, makes addition of chemicals easier with excellent agglomeration of suspended solids throughout the entire sand bed. Additional reuse from the operation of the sand filter system will reduce consumption below 10 gpb, amounting to a saving of \$174,000, plus that required for chemically treating fresh water, for a refinery producing 120,000 barrels per day. (Auen-Wisconsin) W75-12115

SODIUM HYDROXIDE TREATMENT OF ACID

MINE DRAINAGE, Environmental Protection Agency, Rivesville, W. Va. Croion Mine Drainage Control Field Site. For primary bibliographic entry see Field 5G.

EFFLUENT TREATMENT FOR A SMALL TAN-NERY.

Research Advisory Service, Inc., Western Springs, Ill. H. H. Young.

Journal American Leather Chemists Association, Vol 63, No 8, p 308-315, 1973. 11 fig.

Descriptors: *Waste water treatment, *Tannery wastes, Sludge, Chromium, *Illinois, Recycling, Filters, Treatment facilities.

The described treatment facility was based on standard procedures for handling fluid wastes on a 70,000 gpd volume, fluctuating from 2000-10,000 gallons/hr over a 12-hr period. The tannery used a hair-saving operation, chrome tanning with some vegetable or synthetic re-tan was employed, the waste streams' composition were unvaried but flow distribution was variable. The municipal stan-dards prescribed that at no time could the fat or grease exceed 100 ppm, the chromium exceed 25 ppm, and the pH fall outside the 4.5-10 range. Recovered fats or settleable solids as sludge would have to be separated and hauled away. The system will cost \$1 for each gallon of daily flow; for larger units the cost would be proportionately less. A new filtering mechanism separated fine thixotrop-ic solids from the fluids. Demonstrations suggested its possible use for the separation of chromium hydroxide. The Dyno-Filter produced 30 lbs of dewatered cake and 420 lbs of filtrate 30 lbs of dewatered cake and 420 lbs of filtrate containing 10 ppm of chromium metal equivalent, from 450 lbs of settled sludge. 450 lbs of spent chrome liquor containing 0.13% chromium as metal yielded 440 lbs of filtrate containing 8.5 ppm of chromium metal and 10 lbs of filter sludge cake containing 5.6% chromium metal, reflecting a 95.5% chromium recovery. (Auen-Wisconsin) W75-12118

SOME ASPECTS OF A CHEMICAL TREAT-MENT OF THE WASTE WATERS FROM THE

Institute TNO voor Leder en Schoenen, Waalwijk (Netherlands).

Journal American Leather Chemists Association, Vol 68, No 8, p 339-345, 1973, 7 fig.

Descriptors: *Waste water treatment, *Tannery wastes, *Oxidation, Industrial wastes, Organic Joading, Sulfides, Manganese, Aeration, Hydrogen ion concentration, Chemical oxygen demand, Nitrogen, Sulfur, Water reuse, Europe.

Identifiers: *Beamhouse liquors, Process modification, Acidification.

Chrome leather tanning waste water contains 75-Chrome leather tanning waste water contains 75-80% of oxygen consuming substances and nitrogenous materials resulting from the soaking, unhairing, and liming processes. When alkaline liquors are mixed with the acid liquors, the pH is reduced to 8.5-9.5, which precipitates proteins thus decreasing the pollutants of the mixed and settled waste water by 35-45%. This is accommissed the formal of the pollutants of the mixed and settled waste water by 35-45%. This is accommissed the formal of the pollutants of the mixed and settled waste water by 35-45%. This is accommissed the formal of the purpose of th panied by the formation of large sludge quanties with a water content of 95-98% and is difficult to handle. Moreover, 4000-7000 gals/1000 lbs of hides of waste water has to be treated. Presuming that combined soaking and unhairing can be consistent with good leather quality, three experiments were conducted which indicated that the waste load from soaking and unhairing can be collected in a volume of about 300-500 gals/1000 lbs of hides. The oxidative removal of sulfur decreases the alkalinity of the waste water considerably. When the waste water from the combined soaking and unhairing process is acidified, by a small amount of sulfuric acid, to pH 3.5, the organic matter in the settled effluent is reduced about 90%, resulting in a 58% total waste load reduction. The filtering and dewatering properties of the protein precipitate are very good. The spent lime liquor can be reused. (Auen-Wisconsin) W75-12120

SOME ASPECTS OF TANNERY EFFLUENT CONTROL Garden State Tanning Co., Reading, Pa.

S. De Mohan. Journal of American Leather Chemists Association, Vol 68, No 8, p 316-321, 1973. 4 tab, 9 ref.

Descriptors: *Tanning wastes, *Effluents, *Waste water treatment, *Industrial wastes, Chromium, Water conservation, *Pennsylvania, Sludge. Identifiers: Beamhouse liquors

The Garden State Tanning Company, Reading, Pennsylvania manufactures upholstery leather by a chrome tanning method. By adopting the hide processor water use was reduced and sulfide requirements were reduced by about 40%. Pilot plant experiments with manganese sulfate at the pant experiments with manganese surface at the rate of 200 g/cu m as a catalyst in sulfide oxidation by aeration indicated that sulfide can be reduced considerably. After aeration for 8 hours the pH of the liquor was reduced to 9.5 then 10 g alum/gallon the liquor was reduced to 9.5 then 10 g alum/gallon was added. When the precipitate was allowed to settle the BOD5 of the liquor was reduced by 77.5% the sludge volume was about 12% of the total volume. To every 45 gallons of exhaust chrome liquor 1.88 lbs lime powder was added, then 157.5 g of Primafloc A-10 was added gradually and allowed to stand for 4 hours. The top gradually and allowed to stand for 4 hours. Inte to supernatant liquor can be easily decanted or siphoned off and contains only 0.4 ppm chromium. The pH of the water is 8.2 and the water can be reused in pickling and chrome tanning. The chrome studge was dissolved in concentrated hydrogen sulfate to convert it to basic chromium. sulfate. The pH of the recovered chrome solution was 2.7-2.8. (Auen-Wisconsin) W75-12123

NO-EFFLUENT TANNERY PROCESSES, Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.

D. A. Williams-Wynn.

Journal American Leather Chemical Association, Vol 68, No 1, p 5-13, 1973. 15 ref.

Descriptors: *Tannery wastes, *Effluents, Sodium chloride, Lime, Industrial wastes, *Waste water treatment, Water reuse, Recycling.
Identifiers: Process modification, Vegetable Identifiers: Process modification, Vegetable tanning, Beamhouse liquors, Liritan process,

At various stages in the conversion of raw hide to tanned leather, steps can be taken which will result in lower effluent volumes and a reduction in the amount of solids, both in solution and as sludge, which needs to be discharged. Salt from curing is a major contributor to the total dissolved solids in effluent and alternatives to salt curing are discussed. Processes in the beamhouse result in the greatest amounts of contaminating substances in tannery effluent, some originating from the hides, while others are from chemicals used by hides, while others are from chemicals used by depilation. Excessively large amounts of lime are frequently used by tanners, whereas not more than 2% is adequate for liming and assuring that no undissolved material is left, thus reducing the amount of sludge to negligible proportions. Soluble protein is easily destroyed by aerobic digestion and sulfide is converted to harmless substances by manganese-catalyzed oxidation. The use of closed circulator tanning systems in vegetable tanning ensures that the minimum amount of tannin is lost by discharge into the effluent. The original Liritan pit process and the Liritan semi-rapid pit/drum process are described, as are the use of low floats, or nofloats procedures for chrome tanning, retanning, dyeing, and fatliquoring. (Auen-Wisconsin) W75-12124

COMPLETE INDUSTRIAL WASTE-WATER REUSE GOAL OF REFINING STUDY, Bechtel Corp., San Francisco, Calif. Ecology and Water Quality Group. J. W. Porter, J. H. Blake, and R. T. Milligan. Oil and Gas Journal, p 70-74, October 1, 1973. 1 fig, 3 tab, 5 ref.

Descriptors: *Water conservation, *Recycling, *Oil industry, *Pollution abatement, Industrial wastes, Waste water treatment, Model studies, Cooling water, Salts, *Water reuse. Identifiers: Oil refineries.

The requirements to provide ever-higher levels of treatment for industrial waste waters and to meet

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the national goal of zero discharge of pollutants to waterways by 1985 provide incentives to reduce the volume of effluents from oil refineries. A typical 100,000-b/d integrated oil refinery is con-sidered in this study. A block flow diagram shows the waste water collection and treatment system. The case of an inland refinery is considered first, followed by modifications to the system to show a coastal location where discharge of clean, salty water would be permitted. The treatment system water would be permitted. The treatment system at the inland refinery is designed on the premise that the only discharges will be petroleum products, solid salts, and allowable emissions to the atmosphere. The various treatment steps are delineated. In reducing pollutant discharges to zero in the coastal refinery it is assumed that the evaporation of salty waters can be eliminated and the water would be reused if its salt content is low enough. Since the cooling tower blowdown must be treated thoroughly to remove heavy metals and organics, its volume would also be reduced. Esti-mates are made of both capital and operating and maintenance costs associated with 'best practicable technology' in these base cases. (Auen-Wisconsin) W75-12125

OPERATIONAL VARIABLES AND LIMITA-TIONS OF DIRECT FILTRATION, Ontario Ministry of the Environment, Toronto. Pollution Control Branch. For primary bibliographic entry see Field 5F. W75-12127

EVALUATION OF A COAL-SEWAGE TREAT-MENT PILOT PLANT.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price \$1.00. Office of Coal Research, Research and Development Report No. 63, (1971). 58 p, 24 ref. 14-32-0001-1205.

Descriptors: *Waste water treatment, *Sewage treatment, *Coals, Filters, Suspended solids, Dissolved solids, Adsorption, Costs, Activated carbon, Pilot plants Identifiers: *Coal filtration.

A pilot plant study on the feasibility of a coal filter process for treating raw sewage was performed. Treatment comprises passing sewage through a bed of small uniformly sized coal particles where filtration of the suspended solids and adsorption of dissolved organics occurs. The coal treatment process and the equipment it requires, the efficiency and costs of the method, the applicability and further developments of the process are discussed. Coal filtration is also discussed in relation to other treatment methods. Coal filtration is an excellent method for suspended solids removal, but only partially reduces the dissolved organics content.

One-step coal filtration will not produce water
which meets current water quality standards.

However, the use of coal char or activated carbon may increase the efficiency sufficient to allow for the one-step treatment of sewage. The most promising application of coal filtration is as a preor post-treatment step for suspended solids removal combined with a treatment step for dis-solved solids removal. Coal filtration can be economically competitive if heat is recovered from all the coal used. This can be achieved by borrowing coal from a pulverized coal user. The estimated cost of development, construction, and operation of a one mgd demonstration plant for one year is \$1,500,000. (Orr-FIRL) W75-12128

BIOCHEMICAL CHARACTERISTICS DIGESTED CHEMICAL SEWAGE SLUDGES, Environmental Protection Service, Otta (Ontario). Water Technology Centre. Ottawa V. K. Chawla, J. D. Stephenson, and D. Liu. In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2, September 18-19, 1974, Toronto, Ontario, Canada, p 63-94, (1974) 9 fig, 15

Descriptors: Treatment facilities, *Sludge, *Nutrient removal, *Waste water treatment, Phosphrus, Nitrogen, Heavy metals, Descriptors: Phosphrus, Phosphrus, Nitrogen, Heavy metals, Polychlorinated biphenyls, Pesticides, Organic compounds, Lipids, Aerobic bacteria, Lime, *Canada, Pollutant identification.

Identifiers: *Phosphorus removal systems, Ontario, Biochemical characteristics, Precipitating agents, Petroleum hydrocarbons.

Phosphorus removal systems are being incorporated into many sewage treatment facilities in Ontario. Precipitating agents are ferric chloride, lime or alum. The differences in chemical composition of these phosphorus rich chemical sludges have caused concern about the potential pollution of surface waters and groundwater, as well as of soil and plant systems. An extensive program was started in 1973 to study the biochemical characteristics of these sludges. Samples were taken from four sewage treatment plants over a fifteen month period and analyzed for nutrients and heavy metals, microbial contents, pesticides, polychlorinated biphenyls (PCBs), lipids and petroleum hydrocarbons. The results showed that each plant has to be considered individually due to variations in concentration of the materials studied. The amount of aerobic heterotrophic bacteria was relatively constant. There was a random variation of heavy metals and only one plant had a high concentration of petroleum hydrocarbons. (See also W75-11715) (Dean-FIRL) W75-12132

VIROLOGICAL INVESTIGATIONS SLUDGES FROM SELECTED ON SEWAGE PLANTS, Ontario Ministry of Health, Toronto. ONTARIO

T. P. Subrahmanyan. In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 95-109, (1974) 7 tab, 9

Descriptors: Treatment facilities, *Viruses, *Waste water treatment, Sludge, Sewage, Effluents, Sewage treatment, Pollutant identifica-*Viruses,

Identifiers: Ontario Ministry of the Environment, Toronto Works Department.

In cooperation with the Ontario Ministry of the Environment and the Toronto Works Department, the Virus Laboratory of the Ministry of Health conducted an investigation of viral isolation in sewage and sludge. Three hundred and fifty three sewage and studge. Infee hundred and fifty three specimens were collected between April and December 1973, from four sewage treatment plants. These specimens included sewage, raw sludge, digested sludge, and effluents. Viruses were isolated in 38.7% of the sewage, 13% of the raw sludge, and 0.9% of the digested sludge samples. During the colder months enteroviruses were rare or absent and reached their peak during August and September. The results showed low viral hazards. Further surveillance and routine monitoring are necessary. (See also W75-11715) (Dean-W75-12133

REGULATORY ASPECTS OF SLUDGE UTILIZATION ON LAND. Ontario Ministry of the Environment, Toronto.
Pollution Control Branch. For primary bibliographic entry see Field 5G. W75-12134

LAND DISPOSAL OF SEWAGE SLUDGE, Guelph Univ. (Ontario). Dept. of Land Resource Science.

T. E. Bates, E. G. Beauchamp, J. W. Ketcheson, R. Protz, and J. R. Moyer.

In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 143-149, (1974).

Descriptors: *Sludge disposal, *Fertilization, Soil science, *Sewage sludge, *Heavy metals, s: *Sludge disposal, *Sewage sludge, *Heavy *Sewage *Nutrients, Science, *Sewage sludge, *Heavy *Pathogenic bacteria, *Nutrients, Nitrogen, Rates of application. Identifiers: Land application, Crop quality.

An outline is presented of research being per-formed at the University of Guelph, Ontario, on the land disposal of sewage sludge. The major objective is to determine maximum rates of sewage sludge application which can be used on agricultural soils without contaminating subsurface water with nitrate nitrogen and surface water with pathogenic organisms, and without lowering the quality of the crops grown. Specific research is being performed to determine rates of sewage sludge which may be safely applied to certain slopes at specified times of the year and to ex-amine the movement of nutrients and other com-ponents of sludge on field plots. Field rate and source studies should provide conditions for nutrient, metals, bacteriological and soil characterization studies. Research is being done to deter-mine the application rates of chemically treated sludges which may be used on typical Ontario soils without being detrimental to crop and soil nutrient and heavy metals content. Studies on nitrogen have two objectives: to determine the availability to plants of nitrogen in chemically treated sludges, and to estimate the losses of nitrogen to ground-water. Also, research is being conducted to establish a simple test for plant available metals in soils by selecting suitable extractants with particular emphasis on copper and cadmium, to determine the numbers of total coliforms, fecal mine the numbers of total coliforms, fecal coliforms and fecal streptrococci in the sludges, and to characterize the soils in terms of soil structure and movement of Ca, Fe, and Al used in sludge treatment. (See also W75-11715) (Orr-FIRI.) W75-12135

NITROGEN TRANSFORMATION AND UP-TAKE

Guelph Univ. (Ontario) . Dept. of Land Resource For primary bibliographic entry see Field 5B. W75-12136

RUNOFF AND EROSION LOSSES. For primary bibliographic entry see Field 5B. W75-12137

SOME MICROBIOLOGICAL ASPECTS OF THE LAND DISPOSAL OF SLUDGE, Guelph Univ. (Ontario). Dept. of Microbiology.

Johnston.

In: Sludge Handling and Disposal Seminar, Con-ference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 185-191. (1974) 1 fig,

Descriptors: *Sludge disposal, *Fertilization, *Bioindicators, *Pathogenic bacteria, Runoff, Sal-monella, Shigella, Public health, Water pollution

Research being conducted at the University of Guelph, Ontario, on land disposal of sewage sludge includes studies to establish the numbers of some groups of indicator bacteria in run-off waters and sludges, and to determine the presence or absence of pathogens such as Salmonella and Shigella in sludges, run-off waters and on plants harvested from areas receiving sludge. Examina-tion was made of sludge applied, runoff from con-trol and treated plots, and plots growing corn and grass. Preliminary observations include: the ex-amination of sludge and run-off water for the estimation of commonly employed indicator organisms has little value in assessing the influence of

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sludge on run-off water: the number of Salmonella and Shigella bacteria found in sludge and run-off water appears to be quite low; and, some Sal-monella and Shigella forms seem to be capable of surviving for a short time in sludge and sludge-soil mixtures. (See also W75-11715) (Orr-FIRL)

CATION DISTRIBUTION IN SOILS AS RE-LATED TO SEWAGE SLUDGE DISPOSAL ON

Guelph Univ. (Ontario). Dept. of Land Resource Science.

For primary bibliographic entry see Field 5B. W75-12139

ANALYSIS OF HEAVY METALS IN SEWAGE SLUDGE AND LIQUIDS ASSOCIATED WITH

Toronto Univ. (Ontario). Dept. of Geology; and Toronto Univ. (Ontario). Dept. of Chemistry, For primary bibliographic entry see Field 5A. W75-12140

EXTRACTABLE METALS IN MIXTURES OF SOIL AND SEWAGE SLUDGE,

Department of Agriculture, Ottawa (Ontario). Soil Research Inst.

M. D. Webber, and J. D. Gaynor. In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 249-266. (1974) 6 tab,

Descriptors: *Sewage sludge, Land, *Metals, Soil texture, Canada, Waste water treatment. Identifiers: Ottawa.

There has been evidence primarily from England that the use of sewage sludge on farmland can result in trace metal pollution. The Soil Research Institute, Ottawa, Canada, has conducted studies on the solubilities of sludge metals in soils. Six acid soils with wide ranges of organic matter and clay content were used. Five anaerobic digested sewage sludges from various points in Ontario were incubated and mixed with the soil. The sludges were iron chloride treated sludges from two different locations, alum treated sludge, untreated sludge, and a lime treated sludge, each treated studge, and a lime treated sludge, each from a different location. The extractable metals were measured either before and/or after incubation in 0.05M EDTA, 0.005 DTPA, and 0.01M CaCl2. Increased levels of extractable metals seemed related to the addition of sludge. A large increase in soil pH was caused by adding the lime treated sludge. Although soil texture affected the extractability of zinc it did not appear to do so with other metals. (See also W75-11715) (Dean-FIRL) W75-12141

CHEMICAL TESTS FOR PLANT AVAILABLE METALS IN SOILS

Guelph Univ. (Ontario). Dept. of Land Resource

For primary bibliographic entry see Field 5A. W75-12142

PRIMARY DEVELOPMENTS OF AIR-BORNE BACTERIA IN THE OECD ACTIVATED SLUDGE SYSTEM,

CIBA-GEIGY Ltd., Basel (Switzerlar Dyestuffs and Chemical Div. H. R. Hitz, G. Plichta, J. E. P. Young, and J. M. Basel (Switzerland).

International Biodeterioration Bulletin, Vol 11, No 1, p 31-35, 1975. 4 fig, 1 tab, 23 ref.

Descriptors: *Bacteria, *Activated sludge, *Waste water treatment, Infection, Pseudomonas, Biodegradation, Detergents, Analytical Biodegradation, Detergents, Analyses techniques, Bioindicators, Pollutant identification. Identifiers: OECD Confirmatory Test Procedure, Bacillus spp., Air-borne bacteria

The OECD (Organization for Economic Cooperation and Development) Confirmatory Procedure is routinely used for testing the biodegradability of detergents in a modified Husmann Apparatus. Laboratory experiments were conducted to investigate the self-infection processes by air-borne bacteria. The system does not need to be inoculated by bacteria from an outside treatment plant; the activated sludge can form its own flora by self-infection of air-borne bac-As an open continuous culture fermenter, the OECD system tends towards a "flow-balance" within the first 72 hours. The flow-balance is affected by physicochemical and biological factors such as temperature, pH, nutrients, microbial antagonism, symbiosis, and metabiosis. More than half of the bacteria isolated and identified belonged to the genus Pseudomonas. The majority of the remaining bacteria were Bacillus spp. The results of the experiments were reproducible. (Orr-FIRL) W75-12143

FACTORS AFFECTING OXYGEN TRANSFER DURING BUBBLE AERATION
LABORATORY SCALE CONDITIONS. Iowa Univ., Iowa City.

C-Y. Huang. Available from University Microfilm Inc., Ann Arbor, Michigan, 48106. Order No. 75-13765, PhD Thesis, 1974, 109 p.

Descriptors: *Oxygen, *Waste water treatment, Suspended solids, Electrolytes, Surfactants, Dis-solved oxygen, Oxygenation, Water treatment. Identifiers: *Oxygen transfer rate, Surface active

Factors affecting oxygen transfer from air into liquid, such as inorganic electrolytes, suspended solids, and surface active agents, were studied in laboratory scale tanks. The effects were expressed by the alpha prime factor which is defined as the ratio of (K sub L)a in solution to (K sub L)a in demineralized water. The alpha prime factor increased in the electrolyte concentrations. The presence of suspended solids in the solution decreased the oxygen transfer rate. Significant decreases were observed with bentonite, asbestos fibers, and activated studge. The combination of the additives produced a different effect as com-pared to the effect of the additives alone. A combination of the surface active agent and suspended solids produced a smaller decrease in the oxygen transfer rate than when either additive was present alone. The inorganic electrolyte increased the oxygen transfer rate but when it was present with the surface active agents, a larger decrease occurred. The effects of the additives were analyzed by considering the change of water molecular structure, hydrodynamics of the solution, and the interaction between the additives. The magnitude of the effect of each substance was not a simple function of substance or ionic concentration but also involved of the substance. The saturated oxygen concentra-tions were also evaluated. (Orr-FIRL) W75-12144

FLOATING AQUATIC PLANTS REMOVE CHEMICALS FROM POLLUTED WATERS. For primary bibliographic entry see Field 5G. W75-12145

UNUSUAL FEATURES IN PLANT DESIGN. For primary bibliographic entry see Field 5F. W75-12146

CONTROL SYSTEM FOR SHOWA WATER PU-RIFICATION PLANT, (IN JAPANESE), For primary bibliographic entry see Field 5F. W75-12147

ADSORPTION OF POLIOVIRUS ONTO ACTIVATED CARBON IN WASTEWATER,

Baylor Coll. of Medicine, Houston, texas. Dept. of Virology and Epidemiology. C.P. Gerba, M. D. Sobsey, C. Wallis, and J. L.

Environmental Science and Technology, Vol 9, No 8, p 727-731, August, 1975. 8 fig, 4 tab, 19 ref.

Descriptors: *Waste water treatment, *Activated carbon, *Adsorption, Hydrogen ion concentration, *Sewage treatment, *Viruses, Acidity, carbon, *Au-

Identifiers: Lime coagulation, Batch studies, *Poliovirus, Viral removal. Freundlich isotherms.

An investigation was made to determine how to An investigation was made to determine how to optimize activated carbon adsorbion of viruses from treated sewage. Poliovirus removal from sewage effluents was improved significantly (by about 25 times) by lowering the pH from near neutral (8) to 3.5-4.5 or by reducing the concentrations of soluble organic matter by lime coagulation. However, further study is required to determine if each or observations on the service convenies of the solution. mine if carbon column operation under acidic conditions would be economically feasible and practical. Batch studies showed that Freundlich isotherms could be used to describe virus adsorption to activated carbon. Column studies indicated that viral removal efficiency was dependent on column length and hydraulic loading, with greater removals at lower loading. (Kramer-FIRL) W75-12148

BIOLOGICAL WASTE WATER TREATMENT, T. Yamauchi, and K. Matsumoto. Mitsubishi Juko Giho, Vol 12, p 118-124, January, 1975. 11 fig, 12 tab, 11 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Trickling filters. Identifiers: *BIO-PAC Process, Japan.

Various biological methods for waste water treat-ment have been developed. The most widely used biological method is the activated sludge process. A description is given of a new process for the A description is given of a new process for the treatment of waste water containing a high concentration of salt. One problem with activated sludge treatment is the development of bulking which prevents the waste water from being treated. In this case a trickling filter is required. A new process, the Mitsubishi BIO-PAC Process, has been developed for the treatment of waste water when bulking is a problem. The results of application of this new BIO-PAC Process are also discussed. (Orr-FIRL) W75-12149

BERRY HILL SLUDGE TREATMENT WORKS, Wessex Water Authority (England). Avon and Dorset Recovery Div.

Value and Waste Treatment, Vol 18, No 4, p 17-19, April, 1975. 6 fig, 3 ref.

Descriptors: *Treatment facilities, *Sewage treatment, *Waste water treatment, *Sludge treatment, Channels, Aeration, Activated sludge, Filters, Odor, Dewatering, Sludge disposal, Digestion tanks, Settling basins. Identifiers: Comminutors, Detritors, Land application, Sedimentation tanks, Settling tanks, Storm tanks, Sludge drying beds, Sludge thickening wells.

The sewage treatment facility for Bournemouth has been constructed in two stages and at two locations and was designed to serve a population of 200,000. The main sewage treatment works located at Holdenhurst consists of inlet channels, comminutors, detritors, sedimentation tanks, aeration activated sludge units, final settling tanks, nitrifying filters, and storm tanks. In order to override certain objections, the sludge treatment works were constructed two miles away at Berry Hill.

The Berry Hill plant consists of raw sludge thickening wells, primary and secondary sludge digestion tanks, sludge drying beds, and a site for filling tankers which dispose of the digested sludge on farmlands. The sludge is pumped from the main sewage treatment plant at Holdenhurst. In order to minimize odor problems at Berry Hill, sludge thickening tanks have been equipped with fiberglass covers and deodorizing systems. (Dean-FIRL) W75-12150

THE RELATIONSHIP BETWEEN PROCESS CONFIGURATION AND PROCESS PER-FORMANCE, University Coll. of Swansea (Wales). Dept. of

Chemical Engineering.

Journal Water Pollution Control Federation, Vol. 47, No. 5, p 1005-1011, May, 1975. 4 fig, 1 tab, 7

Descriptors: *Activated sludge, Analytical techniques, *Performance, Flocculation, Ef-*Waste water treatment, Nutrient

Identifiers: Plug flow process, Continuous flow, Stirred tank reactor (CFSTR), Effluent quality.

An analytical study was conducted to compare the performance of the ideal continuous flow, stirred tank reactor (CFSTR) with the ideal plug flow activated sludge process. Both the CFSTR and the nominal flow process may be designed using the same criteria. This is unusual because plug flow processes are normally considered more efficient than the CFSTR because of higher average reaction rate. It has been suggested that either funda-mental biological differences exist between the two processes or that backmixing is so great in conventionally designed processes, that they become similar to CFSTR's. Neither explanation become similar to CFSTR's. Neither expandation has been accepted as complete, and this analysis was carried out to demonstrate that in real systems, required operating constraints force the result that both ideal plug flow and ideal CFSTR processes effectively produce the same effluent quality. Mass balance equations for both plug flow and CFSTR processes were outlined. Rate coeffi-cient values and yield were also described. Per-formances of the two processes were compared by determining effluent concentration values over a range of cell resident times. The most significant finding was that, in the cell residence time region necessary for good cell flocculation with respect to cell separation, both systems gave acceptable effluents. The critical factor in activated sludge process design must therefore be to accomplish organic removal by producing well flocculated sludge. (Kramer-FIRL) W75-12152

PRIMARY SOLIDS/LIQUID SEPARATION. Water Services, Vol. 79, No. 951, p 200-201, May, 1975. 1 fig.

Descriptors: *Flotation, *Waste water treatment, *Water treatment, Suspended solids, Pilot plants, Bubbles, Color, Flocculation, *Separation Identifiers: *Dissolved air flotation, *Solids

A dissolved air flotation process has been designed for the primary solids/liquid separation stage necessary in the treatment of many potable and industrial waters and waste waters. Treatment is effected by air microbubbles which attach to the is effected by an incroduologies which attach to the feed solids creating a positive buoyancy which causes the solids to float rapidly to the surface in-stead of settling slowly. The floatation process permits separation rates in the range from 8 to 11 cu m/sq m/hr so that smaller, more economical tanks than the usual settlement tanks can be constructed. The advantages of flotation include its adaptability to a wide range of application, its flex-

ibility in operation, and its rapid plant start-up and shut-down. Coagulation and flocculation are required for the effective removal of color and colloidal matter. The use of microbubbles in the flota-tion system produces a smaller floc which reduces the time needed for flocculation as compared to a settlement system. Compressed air is dissolved in a small quantity of recycled water at pressures at or above 4.0 atmospheres. The saturated air/water solution is released under controlled conditions in the flotation tank to produce a cloud of microbubbles which envelops the solids in the feed flow. Studies using a pilot water treatment plant incorporating chemical treatment, flocculation, flotation, and filtration have substantiated the viability of flotation as a primary solids/liquid separation process. A typical process flow diagram for primary solids/liquids separation by flotation is presented. (Orr-FIRL) W75-12153

PRINCIPLES AND TECHNIQUES FOR CONDI-TIONING OF WASTE-ACTIVATED SLUDGE BY DIRECT SLURRY FREEZING,

Virginia Polytechnic Inst. and State Univ., Blacksburg. M. Z. A. Khan. PhD Thesis, 1974, 256 p.

Descriptors: *Waste water treatment, *Sludge reatment, *Freezing, Dewatering, Domestic wastes, Industrial wastes, Pulp and Paper industry, Filtration, Costs, *Activated sludge.

Direct slurry freeze conditioning of waste-activated sludge achieves a significant improvement in dewatering. Dewatering characteristics were defined by the specific resistance and coefficient of compressibility values, by settling, and by filter cake quality when vacuum filtration and gravity drainage on sand beds were used. Sludge samples were taken from plants treating domestic sewage, combined industrial wastes and domestic sewage, and pulp and paper wastes. Direct microscopic and wet sieve analysis indicated that the primary wet sieve analysis indicated that the primary mechanism of conditioning was the promotion of flocculation by freezing. The degree of condition-ing is a function of the 'butane contact' or freezing time with better conditioning occurring with longer detention times. The direct slurry freezing process is more economical than other sludge conditioning processes such as direct freezing and heat treatment. The estimated cost per ton of dry solids processed was \$6-20. (Orr-FIRL) W75-12154

THE INFLUENCE OF OXYGEN CONCENTRA-TION AND TURBULENCE INTENSITY ON COMPLETE-MIX ACTIVATED SLUDGE PER-FORMANCE, Vanderbilt Univ., Nashville, Tenn.

A. J. Englande, Jr. PhD Thesis, 1974, 178 p.

Descriptors: *Waste water treatment, *Activated sludge, Mixing, Oxygenation, Phenols, Pilot plants, Laboratory tests, Oxygen requirements, Dissolved oxygen.

Identifiers: Complete-mix activated sludge, Floc characteristics, Ox Food/Microorganism ratio. Oxygen

The relationships between oxygen concentration, turbulence intensity, and pertinent process parameters in a complete-mix activated sludge 10 gpm pilot plant treating a phenol waste water were studied. Bench-scale studies were conducted to determine the effect of other factors, such as food-to-microorganism ratio (F/M), the nature of the substrate, the nature of the turbulence, and solids concentration, on the floc size and consequently on the oxygen transfer efficiencies. Bench-scale models are capable of simulating prototype performance as expressed by kinetic substrate removal rate, oxygen uptake rate, floc size, and dehydrogenase activity. Substrate removal for the phenol sludge substantially decreased below a critical oxygen concentration of 0.5 mg/liter DO. Floc size was a function of the nature of the turbulence, the mixing intensity, the nature of the substrate, and the F/M loading. The scale of turbulence must be similar to that of the floc particles to influence floc size. A mixing intensity increase corresponded to a decrease in floc size. The flocs were essentially filament-free and their sizes were small enough so that oxygen diffusion could not be limiting. Two oxygen utilization rate monitoring methods, the DO probe and the off-gas analysis, produced the same results. The oxygen uptake test is an adequate substitute for monitoring bioactivity because of the observed linear relationship between dehydrogenase activiand DO uptake; both parameters increased in value with increasing loading rate. (Orr-FIRL) W75-12155

MATHEMATICAL MODELS AND SIMULA-TION OF WASTEWATER TREATMENT TREATMENT SYSTEMS,

Tokyo Sewerage Bureau (Japan).

M. Koide, S. Nogita, M. Tanuma, and M. Shioya. Hitachi Review, Vol. 24, No. 1, p 49-55, January, 1975. 11 fig, 2 tab, 12 ref.

Descriptors: *Waste water treatment, *Mathematical models, Activated sludge, Water quality, Sewage, Model studies, Computers, Simulation analysis.

Identifiers: *Japan. Computer control. Tokyo(Japan).

In hierarchical multilevel control systems for waste water treatment, computer control achieves mode changing and parameter correcting to effect feed-forward, optimum, and adaptive control. However, advances in this field have been impeded by difficulty in defining the characteristics of the activated sludge treatment process. Hitachi, Limited, in conjunction with the Tokyo municipal authorities, is studying and developing mathematical models for influent volumes in waste water treatment systems and water quality, and is ob-serving their accuracy at the Mikawashima Sewage Treatment Plant of the Sewerage Bureau of Tokyo Metropolitan Government. New control systems are being discovered through the use of these models, which include a sewage inflow prediction model, an aeration tank model, a final clarifier model, static simulation, and dynamic simulation. (Murphy-FRIL) W75-12156

WASTE DISPOSAL SYSTEM,

Cleveland, Ohio. Standard Products Co., (Assignee).

(Assignce).
J. S. Reid.
U.S. Patent No 3,898,161, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 937, No 1, p 202, August 5, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Water pollution control, Domestic wastes, Waste disposal, Heat transfer, Flash distillation. Identifiers: Vaporization, Sterilization

The disposal of liquid and organic human bacteriological waste material by vaporization described. The system has vaporizing means comprised of a boiler which is heated. Liquid and organic human bacteriological waste material is metered into the heated boiler for vaporization and sterilization. The interior walls of the boiler become caked with ash and mineral residue which greatly reduces the efficiency of heat transfer. Such deposits must be cleaned at periodic intervals in order to maintain optimum efficiency of the system. The system includes an arrangement for shutting off waste material and starting flow of fresh water to sweep deposits from the vaporizer. Introduction of fresh water causes the fresh water to flash into steam for helping break deposits from

Group 5D—Waste Treatment Processes

the internal walls. The caked deposits are then swept from the boiler when the fresh water exhaust line is open. The entire internal peripheral surface of the boiler is coated with a non-stick material such as polytetrafluorethylene. (Sinha-W75-12185

LITIGATION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS

Environmental Law Inst., Washington, D.C. For primary bibliographic entry see Field 5G.

OVERLAND FLOW: ANSWER TO WATER CLEANUP CHALLENGE.

Louisiana State Univ., Baton Rouge. Office of Sea

Grant Development.
Aquanotes, Vol 4, Issue 1, p 3-4, March 1975. 2 p,

Descriptors: *Sewage, *Overland flow, *Sewage bacteria, *Sewage, Overland low, 'Sewage bacteria, *Sewage disposal, *Sewage treatment, Wastes, Domestic wastes, Sanitary engineering, Sewage effluents, Water pollution, Water pollution, tion sources, Environmental sanitation, water disposal, Waste water(Pollution), Microorganisms, Microbial degradation, Biodegradation, Tertiary treatment, Water pollution treatment, Discharge(Water), Research and development, Marshes, Spoil banks.
Identifiers: *Hazardous substances(Pollution),

Identifiers: *Hazarde Environmental policy.

Researchers are studying the feasibility of putting the nutrient materials in sewage back to work, while making water supplies cleaner and safer for human use. This article discusses a technique called overland flow, which is currently being investigated. This technique could save state industries millions of dollars, while simultaneously making beneficial use of dredge spoil banks. Because of the enormous costs of tertiary treatment of waste water, scientists are investigating the use of a marsh to effect a natural clarification. The overland flow technique involves application of effluents on the soil surface. Purification and removal of nutrients is accomplished through natural activity of microbes and the plant community, under suitable land conditions. The article continues with a more detailed explanation of the process and concludes that the findings as a result of this project may offer a more economical alter-native to sewage waste treatment. (Fernandez-Florida) W75-12228

MARITIME ADMINISTRATION PROPOSED SHORE FACILITY FOR TREATMENT AND OF SHIP GENERATED OILY WATER WASTES.

Maritime Administration, Washington, D. C. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as EIS-AA-73-1850-F, \$5.25 in paper copy, \$2.25 in microfiche. November 1973. 120 p, 2 map, 3 tab, 19 ref, 2 ap-

Descriptors: *Oil wastes, *Oily water, *Water Jestinous. Only water, water quality, Water, Wastes, Ships, Water quality con-trol, Virginia, Fuels, Barges, Marine biology, En-vironmental effects, Oil spills. Identifiers: *Environmental impact statement,

*York County(Va).

UMI

The Maritime Administration proposes to lease to the Virginia Port Authority the surplus fuel farm portion of the U. S. Navy Complex, known as Cheatham Annex, located in York County, Virginia, for processing oily water wastes from ship's tanks, bilges and ballast operations. The oily water wastes will be transported by barge from the ships in the Hampton Roads area to the processing facility. Historically, it has been the practice to discharge oily bilge and ballast waters into the open oceans, territorial seas, and coastal and harbor waters. The proposed project will be beneficial in providing a facility where oily water wastes can be collected and treated prior to discharge into the York River. The expected adverse environmental impacts of the project include an increase in barge traffic on the York River between the facility and the Hampton Roads area and the creation of oily odors in the vicinity as a result of the treatment process. Additionally, solid wastes from the treatment process will have to be disposed of and mea-sures will have to be taken to alleviate oil spills due to barge collisions, the loading or unloading process or through error at the treatment facility. The following alternatives were considered: use of another land-based facility; use of a floating facility; equiping of vessels with devices for separating oil from water; and no project. (Gagliardi-Florida) W75-12256

MAMALA BAY WASTEWATER TREATMENT AND DISPOSAL SYSTEM, OAHU, HAWAII (FINAL ENVIRONMENTAL IMPACT STATE-MENT).

Environmental Protection Agency, San Francisco, Calif. Region IX.

National Technical Information Service, Springfield Va 22161, USDC, as EIS-HI-74-0011-F, \$9.25 in paper copy, \$2.25 in microfiche. January 2, 1974. 319 p, 24 fig, 23 tab.

Descriptors: *Waste water treatment, *Waste water disposal, *Water quality control, Estuaries, Hawaii, Waste treatment, Water, Disposal, Treatment, Treatment facilities, Water quality, Water quality standards, Estuarine environment, Wastes, Environmental effects, Dusts, Turbidity,

Identifiers: *Environmental impact statement, Mamala Bay, Oahu(HI).

The proposed action involves construction of a regional wastewater treatment and disposal system to serve the Mamala Bay area of Oahu, Hawaii. The area will be served by two unconnected collection treatment and disposal systems which are designed to improve coastal and estuarine water quality. The discharge of 55 mgd of raw wastes off Sand Island and 14 mgd of inadequately treated wastes into Pearl Harbor will be eliminated. Pro-ject construction will result in a number of shorterm minor adverse impacts. These include noise, dust, inconvenience to residents, removal of limited acreage from agricultural production, and turbidity and disturbance of benthic organisms in underwater sections. The project will support con-tinued urbanization of the area and will aid in increasing sources of air, water and noise pollution and congestion. Alternatives considered included construction of only one plant and one outfall, and no construction. (Gagliardi-Florida) W75-12257

THE \$5 BILLION FLUSH.

Congressional Record, Vol 118, p E 7145 (daily ed. July 27, 1972). 1 p.

Descriptors: *Sewage treatment, *Water treatment, *Potable water, Legislation, Water pollution control, Water quality, Water quality control. Identifiers: Emergency community facilities, Public Investment Act, Revenue sharing.

Representative John E. Hunt of New Jersey com-mended his fellow Representative who voted down the Emergency Community Facilities and Public Investment Act of 1972. This bill would have authorized the Secretary of Housing and Urban Development to commit up to \$5 billion for water and sewer projects in communites with subwater and sewer projects in communities with sub-stantial unemployment. Such a bill, its backers felt, would put people back to work, give cities es-sential public works, and lift financial burdens from the budgets of little towns. According to Mr. Hunt, however, it was a redundant, inflationary

measure. He pointed to the fact that there was already an \$18 billion, 3-year water pollution control bill in conference. The Representative also in-troduced into the Record a Washington Post editroduced into the Record a washington rost ettorial which conveyed the same message. The Post editorial found the bill lacking in fiscal responsibility, especially in light of the fact that the backlog of pending water and sewer grants is only \$2 billion. (Hoffman-Florida) W75-12277

METHOD OF REMOVING HEAVY METALS FROM WATER AND APPARATUS THEREFOR, Rockwell International Corp., El Segundo, Calif. (assignee).

M. L. Iverson, and L. R. McCoy.

US Patent No 3,899,405, 5 p, 3 fig, 1 tab, 1 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 627, August 12, 1975.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, Water pollution control, Water quality control, *Heavy metals, Separation techniques, Mercury, Nickel, Zinc, Lead, Cadmium, Copper Electrochemistry, Cathodes, Anodes,

Identifiers: Tin, Tin-coated particles.

The invention provides a method of and apparatus for removing heavy metals from an aqueous solu-tion. The apparatus comprises an electrochemical cell including a liquid container, liquid inlet and cell including a liquid container, liquid inlet and outlet, an oxidation resistant anode, a cathode comprising a body of particles having tin surfaces and electrical means for the passage of a direct electric current between the anode and cathode. The method comprises passing the aqueous solution containing heavy metals through a bed of tin or tin-coated particles and passing a direct current from an anode through the solution and the particles whereby the heavy metal is denosited upon cles whereby the heavy metal is deposited upon the particles. After a desired amount of the heavy metal has been deposited upon the particles, the particles then may be transferred from the cell and regenerated using either an electrochemical or chemical technique. (Sinha-OEIS)

SEWAGE TREATMENT SYSTEMS, Lee, Meyer and Associates, Inc., Westlake Vil-lage, Calif. (assignee). T. F. McGrath.

US Patent No 3,899,423, 7 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 632-633, August 12, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Water pollution control, Mixing, Biodegradation, Filtration, Oxygenation, Coagulation, Disinfection, Equipment. Identifiers: Small volume sewage system, Portable

A process and a system is described for carrying out the process which accomplishes biological digestion of sewage in a small volume followed by emical treatment to assure that all effluent is chemical treatment to assure that all effluent is safe for discharge. The system can be adapted for use in watercraft, mobile equipment and where sewage treatment facilities are not available. The system includes the means for receiving, macerating and delivering the sewage to a mixing tank and at least one settling tank connected to the mixing tank for the separation of solid sewage from liquid sewage. A filter tank receives clarified sewage from the settling tank. A coagulant is injected in the mixing tank and the settling tank. Oxygen is infrom the settling tank. A coagulant is injected in the mixing tank and the settling tank. Oxygen is injected into the mixing and settling tanks and bactericide is injected in the filter tank. The vanes in the mixing tank are placed so as to cause turbulent flow to direct heavy solid particles to the bottom of the tank for bacterial digestion and to direct a cloud of floculated sewage to the bottom of the tank. Pockets of oxygen beneath the vanes provide constant contact between oxygen and the sewage under treatment. (Sinha-OEIS)

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

PROCESS FOR DEMINERALIZING WATER. Consiglio Nazionale delle Ricerche, Rome (Italy). (Assignee).

For primary bibliographic entry see Field 3A. W75-12311

METHOD FOR PROCESSING SLUDGE,

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Kanzaki Paper Mfg. Co. Ltd., Hyogo (Japan); and Niigata-Zimpro Ltd., Tokyo (Japan). (Assignees). M. Ohuchi, T. Kitahori, T. Maitoko, and K.

U. S. Patent No 3,901,804, 5 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 937, No 4, p 1423, August 26, 1975.

Descriptors: *Patents, *Waste water treatment, *Sludge treatment, *Water pollution control, *Industrial wastes, *Coagulation, Separation techniques, Aluminum, Hydrogen ion concentrations.

A method of processing sludge resulting from coagulation-separation treatment of industrial wastewater is described. A coagulant which comprises an aluminum compound or compounds is used in which the sludge resulting from the wastewater treatment is subjected to wet air oxidation treatment under a special conditions. The aluminum compounds in the treated sludge are recovered to reuse. It is important to control the pH in proper range to prevent the insoluble alu-minum compounds from forming in the oxidized sludge after wet air oxidation treatment. For that purpose the pH of sludge is adjusted beforehand to keep the pH of oxidized sludge at the range below 1.5 or above 9.0. (Sinha-OEIS)

HIGH ENERGY ELECTRON TREATMENT OF

WATER,
High Voltage Engineering Corp., Burlington,
Mass. (Assignee).
J. G. Trump.

U. S. Patent No. 3,901,807, 5 p, 11 fig, 3 ref, Official Gazette of the United States Patent Office, Vol 937, No 4, p 1424, August 26, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Water pollution control, *Water quality control, Oxidation, Microbial degradation, *Irradiation, Chemical degradation, Equipment.

The microbiological and chemical activity of water containing microorganisms and other impurities is reduced by irradiating such water with high energy electrons. A device mixes the water with a gas to supply the water with oxygen and the water passes supply the water with oxyger and the water passes through a constricted region where the electron beam irradiates the water. The conduit for the water is an enclosure which includes a narrow metallic duct of extended cross section, having at least one extended end formed of a thin walled releast one extended end formed of a thin walled region permeable to high energy electrons. By having the duct in the region of the high energy electron beam, economics in pumping power are achieved while providing the desired high velocity of fluid flow. Before the water is irradiated, it passes through a region where a gas is injected into the water to reduce the density of the water. The air gas mixture increases the effective size of the duct area which further economizes the operation by permitting the use of lower energy electrons. When the gas contains oxygen, the contaminated water receives oxygen and desirable oxidation occurs at the time of irradiaton or shortly after. (Sinha-OEIS)

THE IMPACT OF CHEMICAL POLLUTION ON WATER UTILIZATIONNUTZUNG), (CHEMISCHE GEWAESSERVERUN-REINIGUNG UND WASSER Karlsruhe Univ. (West Germany). Carl Engler-und Hans-Bunte-Institut fuer Mineraloel-und Kohleforschung.

For primary bibliographic entry see Field 5B. W75-12314

STUDIES OF PREVENTION OF WATER POL-LUTION, III. ON THE BIODEGRADATION OF SYNTHETIC DETERGENTS, (IN JAPANESE), For primary bibliographic entry see Field 5B.

WATER CONSERVATION IN SWEDEN: II. POLLUTION CONTROL,
National Swedish Environment Protection Board.

For primary bibliographic entry see Field 5G. W75-12317

NEW ORLEANS CHOOSES OXYGEN ACTIVATED SLUDGE. Civil Engineering, ASCE, Vol 45, No 6, p 84, June, 1975.

Descriptors: *Waste water treatment, *Activated Activated sludge, "Sewage treatment, "Construction costs, Treatment facilities, Pilot plants, Biochemical oxygen demand, Oxygen costs, "Louisiana. Identifiers: Secondary treatment, New Orleans (La), Oxygen activated sludge.

A secondary treatment plant is being built to handle New Orleans waste water. Because this is a new facility, a choice existed between air ac-tivated sludge and oxygen activated sludge. With air activated sludge, reductions in BOD and SS were predicted at 85%. In a pilot test of an oxygen system, BOD removals were 90-95% and SS removals were 87-93%. Thus, the oxygen activated sludge process was implemented, and will be complete in 1976. Advantages of the oxygen method are that it requires less aeration tank space; it can handle more variation in flow rate, space; it can handle more variation in how rate sewage strength, and storm flows; it utilizes covered aeration tanks, eliminating hazards of splashing, aerosols, and odors; and costs will be lower. Disadvantages of the system are that preventive measures must be taken against leaks; careful selection of metals must be made, as oxygen is corrosive to many metals; and about every two years, on-site generators will have to be repaired and/or overhauled, necessitating tempo-rary and expensive trucked-in oxygen. The new facility will require on-site oxygen generation using two 70 ton cyrogenic generating units. Plant costs will be about \$29 million, or about \$240,000 per mgd treated effluent. (Kramer-FIRL) W75-12318

MINNEAPOLIS KEEPS ON TRUCKIN',

Minneapolis Water Works, Minn. C. O. Taflin, N. F. Weber, A. J. Kramer, and J.

Water and Wastes Engineering, Vol 12, No 5, p 24-29, May, 1975. 3 fig, 3 tab.

Descriptors: *Treatment facilities, *Waste water reatment, *Dewatering, Sludge treatment, Con-struction, Lime, Economic feasibility, Magnesi-um, Polymers, Testing, Minnesota, Calcium, *Recycling.
Identifiers: Minneapolis (Minn), Sludge storage,
Tanks, Lime recycling.

Minneapolis has instituted a three part program for pollution control of its water works, which includes recycling filter washwater, construction of a sludge dewatering plant, and an investigation to determine the feasibility of lime recycling. The sludge dewatering plant is a building in two parts, a single story low portion which is made of face brick with concrete block backing, and a higher portion which is insulated sandwich paneling over a structural steel frame. The earth color scheme and attractive landscaping give it an acceptable anand attractive landscaping give it an acceptable ap-pearance. The building which houses the water softening opeation contains the office of the

management of the complex. Two steel tanks were provided for in-process sludge storage. The larger is outdoors, and the smaller (used for polymer storage) is indoors. A 1500 KVA substation was constructed to power the plant. The plant is expandable to house a future calcining operation. The major mechanical failure during the first 1 1/2 years of operation was leakage from the sludge tank sludge gates, which were replaced. Also, freezing of the sludge cake in the surge tank occurred during plant start up. By increasing lime dose in the softening plant this problem was solved. The feasibility of lime recycling with the standard lime-alum softening treatment was investigated. It is economically feasible only if the purchase of lime and CO2, and dewatering trucking are eliminated. Experimentation was begun on a lime-magnesium biocarbonate softening process. No conclusive data is available; further testing with magnesium will include the use of polymers. (Murphy-FIRL) W75-12319

ANALYSIS OF REVERSE OSMOSIS FACILI-TIES, GREENFIELD, IOWA,

For primary bibliographic entry see Field 5F. W75-12320

NUTRIENT REMOVAL IN BIOLOGICAL SYSTEMS.

Pretoria (South Africa).

J. L. Barnard. Water Pollution Control, Vol 74, No 2, p 143-154, 1975. 11 fig, 1 tab, 24 ref.

Descriptors: *Nutrient removal, *Waste water treatment, *Biological treatment, Nitrogen, Phosphorus, Nitrification, Denitrification, Activated sludge, Precipitation (Chemical), Sludge

Identifiers: *Bardenfo process, Phosphate removal, Solids retention time (SRT), Physicochemical treatment.

Purely biological methods of nutrient removal are discussed. Removal of nutrients may be due to sludge synthesis or to wastage and the amount is dependent to a local dependent to a large degree on whether the assimilated nutrients in the waste cellular material are returned to the aeration basin. Fixed-media denitrification and suspended media dentrification denitrification and suspended media dentrification systems are detailed. A modified activated sludge plant to remove nitrogen through nitrification/denitrification was developed, called the Bardenfo process. In this method, the need for methanol addition is eliminated but the basin size must be increased. Nitrates are used as a source of oxygen, and less sludge, which is more stable, is produced by a long solids retention time (SRT). If the Bardenfo method were applied to an extended aeration plant, costs would include partitions and an additional pump for recycling mixed liquor. These costs would be offset by savings in power due to no necessary increase in the basin size. Phosphorus precipitation in the final clarifiers of some activated sludge plants to which no chemi-Phosphorus precipitation in the final clarifiers of some activated sludge plants to which no chemicals have been added has been attributed to several factors. It seems that phosphate removal is greater with a low MLSS in the aeration basin and a low SRT. It has also been postulated that an increased pH is responsible for precipitation of phosphate. It was concluded that additional research is necessary to provide for better biological systems of nutrient removal without the use of expensive physico-chemical methods. (Kramerexpensive physico-chemical methods. (Kramer-FIRL) W75-12321

COLUMN SETTLING TESTS FOR FLOCCU-LANT SUSPENSIONS,

Envirex, Inc. Milwaukee, Wis. Environmental Science Div.

Science Div.

A. E. Zanoni, and M. W. Blomquist.

Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE3, p 309-318, June, 1975. 7 fig, 7 ref, 3 append.

Group 5D—Waste Treatment Processes

Descriptors: *Waste water *Laboratory tests, Sedimentation, Columns, Plastics, Suspensions, Suspended solids, Sampling, Settling basins, Analytical techniques, pling, Settling basins, *Pollutant identification.

Identifiers: Column settling tests, Flocculant

The sedimentation process is used in almost all waste water treatment and many water purification plants. No one design approach can be used for all applications. The settling behavior of floc-culant suspensions is not amenable to a mathematical description. It is necessary to employ a settling test in order to predict the performance of ng basin. A recommended standard column settling procedure for suspensions with 2,000 mg/liter solids is as follows: construct a 2.67 in setthing column out of 100 m ID clear plastic with wall thickness of 6.3 mm: drill eight 13 mm holes in a straight line at 0.3 m intervals along column length, beginning with first hole 0.38 m from top; insert and seal 13 mm OD by 6.3 mm ID clear plastic nipples 50 mm long each hole, making certain they do not extend beyond the inside face of the column; attach a 76 mm length of latex tubing on each and seal ends with pinch clamp; seal column bottom with clear plastic disk (wall thickness of 13mm); tap center of disk with a 19 mm pipe thread and insert a 19 mm galvinized nipple and brass gate valve with a 19 mm threaded outlet for a garden hose; support columns to wall tightly; place 25 liters of waste water in a 0.08 cu m plastic garbage can; stir; bring to room temperature quickly; pump test liquid into column using the open gate valve (leaving the stirrer on); close valve and let suspension stand 5 minutes; start timer and sample from each port from top down, then sample again after 75, and 100 minutes; proceed with suspended solids analyses; calculate percentage suspended solids removal values; plot removal values at appropriate depth and settling times; interpolate between plotted values to construct 130 percentage removal lines. (Murphy-FIRL) W75-12322

THE EFFECTS OF AEROBIC AND ANAERO-BIC INCUBATION ON THE EXTRACTABILITIES OF HEAVY METALS IN DIGESTED SEWAGE SLUDGE,

Rothamsted Experimental Station, Harpenden

C. Bloomfield, and G. Pruden. Environmental Pollution, No 8, p 217-232, 1975. 10

*Heavy metals, Descriptors: *Extraction Pescriptors: "reavy means, "Extraction, "Aractobic treatment, Zinc, Nickel, Copper, Lead, Cadmium, Chromium, Sludge, Solubility, Sewage, Hydrogen ion concentration, Lime, "Waste water treatment.

The solubilities of Zn, Ni, Cu, Pb, Cd, and Cr in sludge were investigated as affected by aerobic and anaerobic incubation. Digested sludge from the Upper Tame Drainage Authority, Great Britain ed as taken from the drying bed. Variation in pH of the digested sludge during various treatments was shown graphically. Wide variation in the extractability of the metals as well as in the reagents commonly used to assess availabilities of trace metals to plants, such as acetic acid and EDTA, were found. This extractability may increase or decrease, depending both on whether the conditions are anaerobic or aerobic and upon the element and the extractant. No consistent trends were found in the addition of soil and/or lime to sludge as it related to solubilities of these metals during aerobic incubation. (Prague-FIRL) W75-12330

DIGESTER GAS: VALUABLE PLANT FUEL, South Burlington Waste Treatment Plant, N. For primary bibliographic entry see Field 8C.

BIOLOGICALLY MEDIATED INCONSISTEN-CIES IN AERATION EQUIPMENT PERFOR-MACE

Eimco Corp., Salt Lake City, Utah. O. E. Albertson, and D. DiGregorio.

Journal Water Pollution Control Federation, Vol 47. No 5, p 977-988, May, 1975, 9 fig. 5 tab. 4 ref.

Descriptors: *Waste water treatment, *Aeration, *Activated sludge, Dissolved oxygen, Bubbles, Costs, Equipment, Treatment facilities. Identifiers: *Oxygen transfer.

The basic methods used to evaluate the performance of aeration equipment are based on classical aeration theory which states that oxygen transfer is a function of dissolved oxygen (DO) driving forces and the overall transfer coefficient of the physical-liquid system only. However, performance data suggests that this basis is incorrect. Aerator efficiency, corrected to standard conditions, has been shown to be directly related to activated sludge respiration rate. Steady-state oxygen transfer evaluations were performed at several full-scale activated sludge plants. These demonstrated a relationship between mixed liquor uptake rate and the measured standard oxygen transfer capacity. The direct transfer of oxygen from gas bubbles present within the mixed liquor to the microorganisms is concluded to be responsible for this phenomenon. The evidence shows that oxygen is available not only through the two-film oxygen diffusion pathway of classical theory, but also by direct transfer of oxygen from air bubbles to the active mass. Activated sludge system design should be modified to take advantage of direct bubble contact. This would achieve savings in capital and operating costs. (Orr-FIRL) W75-12333

AND URGENT PROBLEM FOR THE WATER INDUSTRY.

INDUSTRY, Wessex Water Authority (England). Avon and Dorset Recovery Div.

J. A. Young. Water, No 3, p 12-14, April, 1975. 3 fig, 5 ref.

Descriptors: *Water treatment, *Sewage treatment, Filters, Oxygenation, Activated sludge, Sewage disposal, Methane, Sludge digestion, Waste water treatment. Identifiers: *Energy conservation, Water industry.

Water authorities as well as other industries are now confronted with the urgent and essential need to conserve energy. The water industry has its peak electricity demand during the summer as opposed to the general peak demand during the winter months. The advanced technology in treatment of water and sewage has proven to be more energy consuming than older methods. The slow sand filter method of water treatment which from a bacteriological viewpoint produces a better filtrate than the newer more energy consuming rapid gravity filter is regaining favor. The traditional rotary biological filters used in sewage disposal operated on gravity but have been replaced by oxygenation ditches, and activated sludge which require energy. Sewage disposal at sea could provide an energy conserving, efficient method of disposal in coastal areas. At the Essex Water Authority's Avonmouth Recovery Works the methane gas produced by sludge digestion in producing 55% of the electricity used to power the works. (Dean-FIRL)

RESORT COMMUNITY PUTS ALL UTILITIES UNDERGROUND.

For primary bibliographic entry see Field 8G. W75-12338

COMPOSTING AND USE OF COMPOST IN SWEDEN,

National Swedish Environment Protection Board,

For primary bibliographic entry see Field 5E. W75-12339

RECENT DEVELOPMENTS OF INSTRUMEN-TATION, CONTROL AND AUTOMATION SYSTEMS FOR WASTEWATER TREATMENT

Tokyo (Japan). Sewerage Bureau. S. Kato, K. Kinbara, and T. Oto. Hitachi Review, Vol 24, No 1, p 35-48, January, 1975. 22 fig, 5 tab, 31 ref.

Descriptors: *Waste water treatment, *Computers, *Activated sludge, *Control nstrumentation, Flow measurement, Sludge treatment, Pumps, Equipment, Pollutant identification.

Identifiers: *Japan, Energy consumption.

A review of the development of modern waste water treatment and control systems in Japan is presented. This includes field type digital control-lers as well as computer control systems with man/machine/process interfaces. Control systems for machinery and drive, with energy saving as a goal have been improved. Instrumentation being manufactured by Hitachi includes the large-bore electromagnetic flow meter, a sludge settling rate meter, a respiration rate meter, and a total organic carbon/total nitrogen analyzer. Minor control systems for unit operations of the activated sludge process are described. Such systems are a dis-solved oxygen concentration/air flow control, a MLSS/return sludge volume control, and a sludge age/drawing volume of excess sludge control. Computer control systems have been designed for effluent quality control and for centralized super-vision. Control of machinery and power consump-tion is effected by aeration blowers, and by pumps for waste water, rainwater, and sludge. (Kramer-W75-12341

ON THE COMPARISON OF REVERSE OSMO-SIS MEMBRANE PERFORMANCE,
Zagreb Univ. (Yugoslavia). Inst. of Physical

Chemistry. For primary bibliographic entry see Field 3A. W75-12347

ORGANIC RESIDUE IN A RECYCLED EF-

FLUENT, PART I, Utah State Univ., Logan. V. D. Adams, E. J. Middlebrooks, and P. D.

Water and Sewage Works, Vol 122, No 6, 82-84, June, 1975. 7 fig, 2 tab.

Descriptors: *Water reuse, *Waste water treatment, *Organic compounds, Chlorine, Analytical techniques, Chemical analysis, Carbon, Effluents, Recycling

Identifiers: Physical treatment, Organic residues.

Use of recycled effluent from a waste water treatment facility, for flushing purposes has been proposed. Such a system consists of utilizing physical treatment in conjunction with a catalyzed hypochlorite generating waste water treatment process. One difficulty of this is the accumulation of organic compound residue in the recycled effluent. An investigation using sophisticated chemi-cal detection techniques was carried out to identi-fy the compounds that accumulated in recycled effluents at a package treatment plant such as for a recreation area. Total and inorganic carbon concentrations were measured; over 60 percent of the carbon was in the organic form. Ether and chloroform extractions were completed with the various peaks in the infrared and nuclear magnetic resonance spectra identified. Extractions were also made of houseboat effluent, obtaining a similar NMR spectrum. It was concluded that under the conditions used for sewage effluent treatment, the majority of the excreted nitrogen compounds should be oxidized to lesser components. Most organic species should be treated by chlorination. Some free radical chlorination should proceed on alkane species present in the effluent, with alkene type compounds to be readily converted by chlorine to saturated compounds containing two atoms of chlorine attached to adjacent compounds. (Kramer-FIRL) W75-12348

EPOXY RESIN APPLICATION AT SEWAGE WORKS.

Water and Waste Treatment, Vol 18, No 5, p 23, May. 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Algal control, *Eposy resins, Treatment facilities, Construction materials, Main-

Identifiers: Polyvinyl chloride, Polyester resin.

The expansion of the Chicken Hall Water Treat-The expansion of the Unicker riail water read-ment Works, Eastleigh, Hants, U. K., to ten 80 ft diameter concrete tanks to handle 600,000 gal of industrial effluent, and domestic sewage from a population of 62,000 was accompanied by a problem of algal growth. Algae had to be cleaned from tank channels and weirs daily by manual brushing. The application of an epoxy primer and topocat based upon resins and curing agents has reduced the necessary cleaning to once a week by forming a smooth resin surface which prevents algae from attaching firmly. The resin incorporates a thixotropic agent to aid even application on vertia thixotropic agent to aid even application on vertical surfaces, a modified amine to facilitate curing at low temperature and in damp environments, and is reinforced with silica flour. The epoxy resin was rowelled onto the tank channel and weirs to a depth of 2 mm. The coating is self levelling which provides a smooth finish to reduce turbulence and surface abrasion. The fully cured topcoat is also highly resistent to leaching. A new polyester resin has been formulated for bonding PVC and is being used as the standard bonding agent for the Coplastix range of rigid PVC penstocks and valves. The polyester resin provides a means for bonding to PVC without the necessity of abrading or etching the PVC with solvents which could cause permanent softening of the PVC. (Orr-FIRL) W75-12349

PROCEEDINGS OF THE ANNUAL CON-FERENCE OF THE BRITISH COLUMBIA WATER AND WASTE ASSOCIATION. For primary bibliographic entry see Field 5F. W75-12350

DISINFECTION TO PROTECT RECREATIONAL AREAS AND POTABLE WATER SUP-

British Columbia Dept. of Health, Vancouver. Occupational Health Div.

L. Kornder. In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 147-151.

Descriptors: *Public health, *Waste water treatment, *Chlorination, *Disinfection, *Potable water, Ozone, Coliforms, Enteric bacteria, Pathogenic bacteria, Water treatment. Identifiers: *Recreational waters.

The reasons for the necessity of disinfecting recreational and potable water supplies are out-lined. The chief reason is the fact that enteric pathogenic bacteria are carried by water and will contaminate the aquatic environment. Some of the currently held standards for recreational water

quality are based on the fecal coliform count since this nonpathogenic bacteria is associated with the more difficult to isolate Salmonella. However, the recent information concerning the carrying of resistance factors (R factors) by coliforms may result in a change in the current water standards. Disinfection of waste water may be accomplished by using chlorine, bromine, iodine, ozone or ul-traviolet light. Chlorine disinfection is the most widely used method. The medical consensus in Canada is that chlorination of waste water discharged to recreational water is essential. Chlorination is also the current most feasible method of disinfecting potable water. A few of the factors which influence the efficacy of chlorine disinfection include: the level of SS; ammonium content; pH; nitrites; iron; and, reaction time. (See also W75-12350) (Оп-FIRL) W75-12351

MUNICIPAL SEWAGE TREATMENT TO PRO-TECT SHELLFISH GROWING WATERS, Environmental Protection Service, Vancouver

(British Columbia). Pacific Region.

T. J. Tevendale.

II. J. Levendare. In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 153-170. 3 tab, 8 ref, 2 append.

Descriptors: *Public health, *Waste water treatment, *Commercial shellfish, Sewage treatment, Mollusks, Lagoons, Coliforms, Water quality control, Water pollution control, Canada. Identifiers: *British Columbia.

Environment Canada is responsible for the sanitary control of the Shellfish Fisheries in British Columbia. Their duties include assessing and classifying the growing water quality of shellfish waters. The bacteriological critieria for an apparent shelling the sanitary of the sanitary o proved shellfish growing water is that the coliform median MPN does not exceed 70/100 ml and not more than 10% of the samples ordinarily exceed a MPN of 230/100 ml for a 5 tube, 3 decimal dilution test in those portions of the area most probably exposed to fecal contamination during the most un-favorable hydrographic and pollution conditions. The percent reduction of coliform bacteria expected from various types of treatment processes is discussed. The highest reduction is expected is discussed. The highest reduction is expected from stabilization ponds. The operational reliability of treatment plants and sewage collection systems is the most important factor in the protection of shellfish growing waters. Suggested methods for the protection of growing waters include: more effective methods of disinfection; zero discharge to shellfish waters of domestic waters: willigation of seasonal holding league. wastes; utilization of seasonal holding lagoon systems during the harvesting season; and, institution of the concept of positioning sewage treat-ment plants and outfalls in accordance with plans developed by agencies responsible for administra-tion of public health, installation of treatment systems, land use, and protection of renewable resources. (See also W75-12350) (Orr-FIRL) W75-12352

TOXICITY OF AQUATIC ORGANISMS CAUSED BY CHLORINATION, International Pacific Salmon Fisheries Commis-ORGANISMS

sion, New Westminster (British Columbia). Environmental Conservation Div.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 171-182. 1 tab, 24 ref.

Descriptors: *Public health, *Waste water treatment, *Chlorination, *Fish, *Toxicity, *Aquatic animals, Sewage treatment, Pathogenic bacteria, Water pollution effects.

Field and laboratory studies have been performed which have demonstrated the toxicity of

chlorinated municipal sewage to fish and other aquatic organisms. It has been proposed that the total residual chloring should not exceed 0.002 mg/liter in areas receiving chlorinated wastes continuously. In areas where disinfection is required to protect public health, alternative methods of disinfection should be used, such as chlorination-dechlorination and ozonation. Chlorination-dechlorination has been shown to be beneficial in protecting both public health and aquatic life.

Dechlorination can be impounding freshly chlorinated sewage in lagoons. Although lagooning chionnated sewage in lagoons. Although lagooning results in secondary regrowth of coliforms, it is hygienically acceptable since there is presumably no regrowth of pathogenic bacteria. In the absence of chlorination, primary sewage effluents were found to be toxic to fish, while effluents from secondary treatment were essentially nontoxic. Acute toxicity or sublethal toxic conditions for fish are present when chlorine residuals exceed 0.02 mg/liter. Chlorinated municipal sewage may have a combined available chlorine residual from 0.1 mg/liter to 3-4 mg/liter. Therefore, the major step in obtaining a nonlethal treated municipal sewage is limitation of chlorine residual to less ples make it possible to discharge a suitable treated waste water which is nontoxic to aquatic organisms and which will not cause public health problems. (See also W75-12350) (Orr-FIRL) W75-12353

WATER QUALITY MANAGEMENT IN A METROPOLITAN AREA, British Columbia Univ., Vancouver. Westwater

Research Centre.

For primary bibliographic entry see Field 5G. W75-12354

COMPUTER CONTROLLED WASTEWATER RECLAMATION PLANT,
Central Contra Costa Sanitary District, Walnut

Creek Calif.

G. A. Horstkotte, Jr., and D. L. Eisenhauer. Public Works, Vol 105, No 6, p 63-66, June, 1974. 2 fig, 1 tab.

Descriptors: "Water reuse, "Waste water treatment, "Reclaimed water, "Digital computers, Industries, Flocculation, Quality control, Water treatment, Nitrification, Lime, Water supply, Automatic control,
*California. Electronic

The world's first fully computer controlled wastewater reclamation facility is being constructed in the San Francisco Bay area. Central Contra Costa Sanitary District with a 735 square mile service area has limited future reserves of fresh water in an area with potential for heavy industry expan-sion. A \$48 million 30 mgd wastewater reclamation plant with ultimate design capacity of 120 mgd will recycle domestic sewage as a source for industrial process and cooling water. The plant design was adopted after a detailed 2-year study utilizing a full-scale pilot plant. Most of the district's wastewater influent is normal domestic sewage since in-dustries are required to pretreat their wastes. The reclamation is an expansion of the existing primary treatment plant. Lime clarification added to the primary treatment, biological nitrification-denitrification, and a 2-stage sludge conditioning process that includes lime recovery make this an advanced treatment system capable of meeting the rigid requirements of industrial water users. Ex-acting standards are maintained by a direct digital control dual computer system. One computer monitors plant data and uses this information to control all treatment processes. The second computer handles off-line functions such as main-tenance scheduling and cost analysis, and serves tenance scheduling and cost analysis, and server as a stand-by control computer. The operator can override computer control if necessary. Two color graphic cathode ray tube (CRT) display units with keyboards and lightpens allow fast information retrieval and color coded display of process com-

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nents. The system is designed for maximum flexibility. (HerrgNorth Carolina)

RECYCLING ALLOWS ZERO WASTEWATER

Black, Crow, and Eidsness, Inc., Clearwater, Fla. L. A. Dove.

Civil Engineering-ASCE, Vol 45, No 2, p 48-51, Feb, 1975. 4 fig, 2 tab.

Descriptors: *Recycling, *Water reuse, *Impaired water use, *Injection wells, *Waste water treat-ment, Irrigation water, Salvage value, Water conservation, Drawdown, Experimental farms, Viruses, Waste disposal wells, Land spreading, *Florida Identifiers: *St. Petersburg(Fla)

A carefully monitored wastewater recycling system in St. Petersburg, Florida, is committed to total recycling of wastewater with zero discharge to surrounding bays. This will reduce the damaging drawdown on the Floridan Aquifer, comply with the 1972 Wilson-Grizzle Act requiring advanced wastewater treatment or its equivalent for all facilities in the Tampa Bay Region, and make use of the nutrients in treated wastewater and sludge.

The primary reuse will be in lawn sprinkling, which now uses 15% to 40% of the public water supply. All virus will be removed by holding the effluent to 0.5 JTU (Jackson Turbidity Units) followed by breakpoint chlorination of 0.5 ppm for at least 60 minutes, a process approved by the administrator of the State Epidermiology Research

mainstrator of the State Eppletrimology Research Center in Tampa. A deepwell injection system is also being prepared as a backup for the recycling system for periods when treated wastewater supply exceeds demand or when quality standards are not met. The injection zone has high transmissivity and already contains water similar in quality to seawater. Disposal of digested sludge from the 4 treatment plants will be by controlled truck spray-ing on the city-owned 150-acre sod farm and nursery. Leachate will be collected by drain tiles, treated, and used for spray irrigation. (Herr-North Carolina) W75-12364

5E. Ultimate Disposal Of Wastes

SPRAY IRRIGATION OF TREATED MU-NICIPAL SEWAGE. British Columbia Univ., Vancouver. Dept. of Civil

Engineering For primary bibliographic entry see Field 5D. W75-11856

DISPERSION AND SETTLING AROUND A WASTE DISPOSAL POINT IN A SHALLOW

Liege Univ. (Belgium). Institut de Mathematique. For primary bibliographic entry see Field 5B. W75-12043

SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL, (LITERATURE REVIEW), Delaware Univ., Newark. Dept. of Civil Engineer-

For primary bibliographic entry see Field 5D. W75-12075

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL. VOLUME

VTN, Inc., Orlando, Fla. R. A. Beluche, G. I. Bergstrom, N. W. Hall, and W. McLellon.

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Available from the National Technical Information Service, Springfield, Va 22161, as PB-236 462, \$5.75 in paper copy, \$2.25 in microfiche. Environmental Protection Agency SW-57d.1, 1973. 143 p, 40 fg, 10 tab, 45 ref.

Descriptors: *Garbage dumps, *Water table, *Feasibility studies, *Landfills, *Florida, Evaluation, Groundwater movement, Observation wells. Sites, Facilities, Waste disposal, Solid wastes, Snes, Facilities, waste unsposin, solid waster, Drainage engineering, Cost analysis, Cost com-parisons, Path of pollutants, Surface waters, Sur-face drainage, Leachate, Earth handling equip-ment, Access routes, Land use, Operating costs, Operation and maintenance, Environmental effects, Water pollution control, Analytical techniques.

techniques: *High water table, Orange Coun-ty(Fla.), Little Econlockhatchee River(Fla.), Demonstration project.

A demonstration project was designed and operated to determine the feasibility of a solid waste landfill operation in Orange County, Florida, an area containing a high groundwater table. The selection of the 1500-acre site was based on investigation of surface topography and subsur-face geology and hydrology which determined the master drainage plan, allowing operation with cer-tain portions dewatered below the level of refuse deposition. Heavy operating equipment was evaluated as to its effectiveness and capabilities under both wet and dry construction and filling operations. The economic assessment includes equipment operating and maintenance, landfill develop-ment, capital improvement, and other operating aintenance costs, and is compared to an incineration facility with equivalent solid waste disposal capacity (280,047 tons). The drainage disposal capacity (280,047 tons). The drainage system proved to be effective in preventing flooding of the total area during intense rainfall and localized flooding was controlled with temporary pumping. Drainage improvements minimized leachates but did not prevent changes in water quality of the upper groundwaters. Procedural refinements and operation techniques were expected to stabilize total costs at approximately \$1.50/ten. A lendfill in a bird groundwater seas con \$1.50/ton. A landfill in a high groundwater area can only be built successfully if the generated leachate can be contained and controlled to avoid pollution of ground and/or surface waters. (Auen-Wiscon-W75-12111

HYDROGEOLOGICAL ASPECTS OF SOLID

WASTE DISPOSAL, Wisconsin Univ., Madison. Water Resources

Management Program.

A. Zaporozec, and D. A. Stephenson.

Institut fur Sozial-und-Wirtschaftspolitische
Ausbildung, Information Bulletin. Vol 7, No 3, p
3-9, 1972. I fig.

Descriptors: *Waste disposal, *Landfills, *Sites, Hydrogeology, Solid wastes, Social aspects, Political aspects, Leachates, Aquifers.

The two trends in the approach to the solution of solid waste disposal problems are technological and regional evaluation of hydrogeological condi-tions. A technological approach assumes that nearly all sites are or can be designed to be suitable for solid waste disposal. The critical factors are then costs analysis, site acquisition, site modifica-tion, and carefully controlled operation using high-level engineering techniques. The knowledge of level engineering techniques. The knowledge of hydrogeological conditions is essential in this ap-proach for determining whether or how to modify the site. The approach is applicable to metropolitan areas where land and transportation neuropoitian areas where there is a paucity of open land for disposal sites. A regional approach rests on the evaluation of the physical conditions of the region and selection of suitable areas for future disposal sites. The search for suitable sites can be concentrated either on ideal sites where no can be concentrated either on ideal sites where no pollution can occur or on sites suitable for 'controlled pollution.' A regional approach is of the 'advanced-planning' type and will gradually gain greater importance with increasing recognition of the necessity to plan waste disposal on a regional basis. Both technological and regional trends have their advantages and disadvantages, and both are equally important in solid waste disposal. (Auen-Wisconsin) W75-12121

GROUND-WATER AND ENGINEERING GEOLOGY IN SITING OF SANITARY LAND-ENGINEERING FILLS

Illinois State Geological Survey, Urbana

K. Cartwright, and F. B. Sherman.
Transactions, Society of Mining Engineers,
AIME, Vol 250, No 1, p 1-6, 1971. 4 fig, 28 ref.

*Landfills, *Sites, *Groundwater, Garbage dumps, Sanitary engineering, Geologic formations, Impervious soils, Water pollution control, Hydrogeology, Geologic mapping.

The salient features of the sanitary landfill concept are summarized and policies are suggested for landfill siting. Illinois regional evaluations of landfill disposal conditions are mapped to show favorable, locally favorable, and unfavorable areas. However, operational practice may preclude the selection of many sites that have less than 10 to 20 ft of unconsolidated material above the bedrock. The map does not show the potential for pollution at individual sites, nor does it take into account the exact physical character of the unconsolidated material or the bedrock formations. Potential landfill sites must be individually investigated before put into operation. The criteria used as a basis for preliminary investigations of hydrogeologic conditions and the potential for groundwater pollution at sanitary landfill sites in Illinois are type of unconsolidated material; thickness of unconsolidated material; type of bedrock; local and potential water sources; and site topography. The engineering approaches that most directly relate to the prevention of water pollution are diversion of surface drainage, interception or diversion of groundwater, collection of leachate for treatment and installation of clay liners. Many strip-mine areas would probably make excellent landfill sites since they are generally in nonurban areas and the coal-producing rocks are not interbedded with important aquifers. (Auen-Wisconsin) W75-12122

AND DISPOSAL OF SEWAGE SLUDGE, Guelph Univ. (Ontario). Dept. of Land Resource Science. For primary bibliographic entry see Field 5D. W75-12135

EXTRACTABLE METALS IN MIXTURES OF SOIL AND SEWAGE SLUDGE. Department of Agriculture, Ottawa (Ontario). Soil

Research Inst. For primary bibliographic entry see Field 5D.

BERRY HILL SLUDGE TREATMENT WORKS. Wessex Water Authority (England). Avon and Dorset Recovery Div.
For primary bibliographic entry see Field 5D. W75-12150

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOG-RAPHY, GEOLOGICAL OCEANOGRAPHY, NATO CHEMICAL OCEANOGRAPHY. National Oceanic and Atmospheric Administra-tion, Miami, Fla. Atlantic Oceanographic and

Meteorological Labs.
For primary bibliographic entry see Field 5B.

W75-12171

OCEAN DUMPING IN THE NEW YORK RICHT.

National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.

For primary bibliographic entry see Field 5B. W75-12172

WASTE DISPOSAL SYSTEM,

Standard Products Co., Cleveland, Ohio. (Assignee). For primary bibliographic entry see Field 5D.

OCEAN DUMPING OVERSIGHT.

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For primary bibliographic entry see Field 5G. W75-12194

1973 IMCO CONFERENCE ON MARINE POL-

LUTION FROM SHIPS.
For primary bibliographic entry see Field 5G.
W75-12202

POLLUTION CONTROL UNDER PENNSYLVANIA CLEAN STREAMS LAW, For primary bibliographic entry see Field 5G.

OVERLAND FLOW: ANSWER TO WATER CLEANUP CHALLENGE.

Louisiana State Univ., Baton Rouge. Office of Sea Grant Development.
For primary bibliographic entry see Field 5D.
W75-12228

OREGON SURVEYS ITS HAZARDOUS

Oregon State Dept. of Environmental Quality, Portland. For primary bibliographic entry see Field 5G. W75-12239

TOUGH SOLID-WASTE LAWS BREWING ON

CAPITOL HILL.
For primary bibliographic entry see Field 5G.
W75-12243

DIKED DISPOSAL AREA SITE NO 12, CLEVE-LAND HARBOR, CUYAHOGA COUNTY, OHIO. Army Engineer District, Buffalo, N. Y. January 2, 1973. 90 p, 16 tab, 9 map.

Descriptors: *Ohio, *Waste disposal, *Channel improvement, *Dredging, *Turbidity, Environmental effects, Aquatic habitats, Odor, Discharge water, Harbors, Construction, Recreation, Aquatic environment.

Identifiers: *Cleveland Harbor, Rock and slag

The environmental impact statement recommends that the Diked Disposal Area Site No. 11 be conthat the Diked Disposal Area Site No. 11 be constructed as proposed. The proposals called for the construction of a rock or rock and slag mound to provide for the disposition of 2,880,000 cubic yards of dredge spoil to be removed from the Cleveland harbor during a two-and-a-half to three-and-a-half year period. The dredging was found to be required to permit the continued maintenance and operation of the existing harbor. Adverse effects considered included the loss of the area occupied by the disposal area as an aquatic habitat, urbidity during construction, and temporary mild nonpungent odors during use of the structure. Other environmental effects considered included the development of 60 acres of new land when the the development of 60 acres of new land when the diked area is filled and the discharge of surplus waters contained in dredged material into harbor waters. The statement noted that precautions will have to be taken to lessen any possible effects the

project will have on recreational activities. (Hoffman-Florida) W75-12255

MARITIME ADMINISTRATION PROPOSED SHORE FACILITY FOR TREATMENT AND DISPOSAL OF SHIP GENERATED OILY WATER WASTES.

Maritime Administration, Washington, D. C. For primary bibliographic entry see Field 5D. W75-12256

MAMALA BAY WASTEWATER TREATMENT AND DISPOSAL SYSTEM, OAHU, HAWAII (FINAL ENVIRONMENTAL IMPACT STATE-MENT).

Environmental Protection Agency, San Francisco, Calif. Region IX.

For primary bibliographic entry see Field 5D. W75-12257

SALT RECOVERY SYSTEM,

For primary bibliographic entry see Field 5B. W75-12306

METHOD FOR PROCESSING SLUDGE,

Kanzaki Paper Mfg. Co. Ltd., Hyogo (Japan); and Niigata-Zimpro Ltd., Tokyo (Japan). (Assignees). For primary bibliographic entry see Field 5D. W75-12312

ENERGY CONSERVATION: AN ESSENTIAL AND URGENT PROBLEM FOR THE WATER

INDUSTRY, Wessex Water Authority (England). Avon and Dorset Recovery Div. For primary bibliographic entry see Field 5D. W75-12334

COMPOSTING AND USE OF COMPOST IN SWEDEN.

National Swedish Environment Protection Board, Stockholm.

G. Hovsenius. Journal Water Pollution Control Federation, Vol 47, No 4, p 741-747, April, 1975. 3 tab.

Descriptors: *Sewage sludge, *Sludge treatment, *Sludge disposal, Treatment facilities, Waste water treatment, Testing, Chemical analysis, Cost analysis, Wastes, Groundwater, Water pollution, Heavy metals, Soils, Public health, Bioassay. Identifiers: *Compositing, *Sweden, Health

A number of municipal waste water treatment plants for biological oxygen demand (BOD) and phosphorus removal have been constructed over the past ten years as a result of a strong environmental policy in Sweden. This in turn has resulted in a rapid increase in the quantity of waste water sludge. The presence of more than 1,000 treatment plants makes sophisticated sludge handling techniques economically prohibitive. More than 60% of the sludge is disposed of in landfills. Com-60% of the studge is disposed of an animal posting would be an alternative to incineration to solve the studge and garbage problems in small communities. Since composting is relatively untested in northern Europe, a test plant was built at these years. Laxa, Sweden to be operated over a three year period by the National Environmental Protection Board. The plant will perform physical, chemical, and bacteriological analyses of nondigested wastes, digested materials, and cured compost for organics, mercury and other heavy metals, pesticides, coli, salmonella, virus, and parasites. Health hazards for plant personnel will be surveyed. Composting processes and technology in relation to different sludges will be evaluated. A cost analysis of the operation will also be done. Groundwater contamination from compost will be investigated. Both greenhouse and outdoor experiments will be conducted to determine the enrichment of heavy metals in soil and plants. (Dean-FIRI.) W75-12339

HOW WELL ARE WE HANDLING TOXIC WASTE.

Surveyor, Vol 146, No 4326, p 19-24, May 2, 1975.

Descriptors: *Waste disposal, *Industrial wastes, *Municipal wastes, Landfills, Investigations, Toxicity, Leachate, *Recycling, Legislation, Oily

Identifiers: Toxic wastes, Refuse, England, Metal hydroxide sludge, Cyanide heat treatment wastes.

Pitsea, Essex County, England, became a site for industry to deposit waste materials due to the Deposit of Poisonous Waste Act of 1972. Following the Act the amount of waste arriving jumped from 11 million gallons per year to 35 million. A greater regionalization in toxic waste disposal is needed to reduce the increased site management and transportation risks inherent in waste disposal areas that are few in number. In 1973 a research program was begun by the Institute of Geological Sciences, Water Research Center, and Hazardous Materials Service (Harwell) to study the behavior of hazardous wastes in landfill sites. Being investigated are the following: flow pattern in the unsaturated zone of rocks; refuse/hazardous waste/refuse sandwich interactions (Wastes being metal hydroxide sludge, cyanide heat treatment waste, and oily waste); and pulverized refuse. Also, a short course run at six-month intervals is being given. The Warren Spring waste exchange is being operated in an attempt to recycle. There have also been proposed revisions of geological formation classification for the purpose of landfill site and assessment. (Murphy-FIRL) W75-12342

5F. Water Treatment and **Quality Alteration**

For primary bibliographic entry see Field 8G. W75-11888

RECYCLABLE COAGULANTS LOOK PROMIS-ING FOR DRINKING WATER TREATMENT,. Environmental Science and Technology, Vol 7, No 4, p 304-305, April, 1973. 1 fig.

Descriptors: *Potable water, *Water purification, Coagulation, Dewatering, Recycling, Magnesium carbonate, Magnesium hydroxide, Calcium carbonate, Water softening, *Water treatment. Identifiers: Lime slurry, Lime-alum treatment.

Drinking water purification methods which utilize am or iron coagulation leave a sludge which is atum or from congunation reads a single strategy difficult to dewater due to its gelatinous properties. A new water treatment process uses magnesium carbonate which is recyclable as the coagulant. In this process, lime slurry is added to raw water which either naturally occurring magnesium bicar-bonate or magnesium carbonate which as been added. The addition precipitates magnesium hydroxide and calcium carbonate. The magnesium hydroxide acts in a manner similar to the hydroly-sis products of iron or aluminum salts and forms a floc which settles impurities out of the water. The treatment system is a combination softening and purification process. The cost of lime-alum treatpurification process. The cost of time-alum treatment, without provision for sludge handling, is \$8-10 per million gallons. The cost for magnesium carbonate treatment, with purchased CO2, high calcium lime, and purchased MgCO3, without recycling of time is about \$19 per million gallons. If dolomitic lime could be used and could serve as a magnesium source, the costs would decrease to about \$12 /million gallons. (Sandoski-FIRL)

Group 5F-Water Treatment and Quality Alteration

WATER SYSTEM OF NEWPORT, RHODE ISLAND AND ITS RECENT IMPROVEMENTS, Newport City Engineers Office, R.I.

P. V. Janjigian. Journal of the New England Water Works Association, Vol 87, No 1, p 41-46, March, 1973. 1

Descriptors: *Water quality, Water storage, Reservoirs, Storage tanks, Population, Surface water, Groundwater, *Rhode Island, Water supply, Water treatment.

Identifiers: *Newport(RI), Biological contamina-

tion.

The City of Newport, Rhode Island provides water service within the City limits and to areas in the Towns of Middletown and Portsmouth. Since 1956 there has been a substantial increase in water consumption and in 1963 the City was urged to take measures to safeguard water quality from biological contamination resulting from lack of cover over treated water storage reservoirs. Improvements since 1965 include: a new 3-mg welded steel storage tank to replace the open storage reservoir, a welded storage tank with 1.5 mg capacity near the Town lines where water consumption has increased rapidly, two intake and pumping stations, expansion of an existning treatment plant from 4 to 8 mgd average, and the rehabilitation, replacement, or installation of approximately 18 miles of mains. With the completion of construction three service areas now supply this region; yet, with unanticiapated population growth the available surface water and usable groundwater supplies are rapidly being depleted. (Sandoski-FIRL) W75-11910

SOUTHERN NEVADA WATER PROJECT. For primary bibliographic entry see Field 3B. W75-11913

APPARATUS FOR CLEANING LOOSE FILTER-ING MATERIAL IN SLOW WATER FILLED WATER SUPPLY FILTERS, B. F. Volokh.

United States Patent 3,732,983. Issued May 15, 1973. Official Gazette of the United States Patent Office, Vol 910, No 3, p 831-2, May 15, 1973.

Descriptors: *Filters, Cleaning, *Patents, *Water treatment, Potable water, Equipment, Filtration. Identifiers: *Filtering material.

An apparatus for cleaning loose filtering material in slow water-filled water supply filters, comprises a washing chamber equipped with means for its movement relative to the surface of the loose fil-tering material being cleaned. Mounted inside the washing chamber are washing tubes to feed clean water into the layer of filtering material to be washed. The washing chamber connects with a suction pipe which passes the dirty water. The chamber is provided with means for regulating its pressure upon the filtering material controlling its degree of byouancy. (Sandoski-FIRL)

SCREEN RETAINER ASSEMBLY, Robertshaw Controls Co, Richmond, Va. For primary bibliographic entry see Field 8C.

THE RISK OF DEOXYGENATION OF WATER IN HERBICIDE APPLICATION FOR AQUATIC WEED CONTROL, University of Wales Inst. of Science and Tech.,

Cardiff.

For primary bibliographic entry see Field 5A. W75-11996

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THE BACTERIAL QUALITY OF BOTTLED WATER.

E. E. Geldreich, H. D. Nash, D. J. Reasoner, and R. H. Taylor.

News of Environmental Research in Cincinnati, May 23, 1975. 4 p, 1 fig, 4 tab, 6 ref.

Descriptors: *Bacteria, *Potable water, Pseudomonas, Coliforms, Enteric bacteria, Water quality, Standards, Public Health. Quality control, ampling. Identifiers: *Bottled water.

Ten per cent of freshly bottled water samples had plate counts above 500 bacteria/ml, 5% contained coliform bacteria, one fecal coliform bacteria, and another Pseudomonas aeruginosa. Forty-two per cent of samples of uncertain age contained above 500 bacteria/ml, 3 had total coliform counts above USPHS Drinking Water Standards, and I contained Pseudomonas aeruginosa. Plate counts varied between and within brands, and increased in 75% of samples stored 30 days. Bacterial population changes occurred in samples stored at room temperature for 63 days. Bacterial growth was reduced when water was refrigerated; peak bac-terial density occurred after 26 days refrigeration and 11 days at room temperature. Bottled drinking water should be analyzed as frequently as required by USPHS standards and repeated when necessary. When bottled, water should contain less than 1 coliform/100 ml and have plate counts less than 500 bacteria/ml. Retailed water should have less than one coliform/100 ml and plate counts less than 1000 bacteria/ml. Plate count limits should be established. Consumers should be advised to refrigerate bottled water and labels should indicate bottling dates and numbers. (Buchanan-Davidson-W75-12011

THE ASSESSMENT OF WATER QUALITY. Anacapa Sciences, Inc., Santa Barbara, Calif. D. H. Harris.

Human Factors, Vol 17, No 2, p 139-148, April 1975. 8 fig, 1 tab, 10 ref. OWRT C-3064(No

Descriptors: *Water quality, *Assessment, *Color, *Odor, *Turbidity, Measurement, Management, Treatment facilities, Variability, Data collections, California, Domestic water, Standards, Water sampling, Potable water, Water supply, *Attitudes, Social values. Identifiers: *Public acceptance, Ratings.

Turbidity, color and odor have the greatest in-fluence on public acceptance and day-to-day con-trol of water quality. The assessment of water quality is likely to grow in importance as the availability of high-quality raw water becomes more limited. Existing guidelines for controlling water quality in terms of public acceptability are inadequate. Reported is a study in which the ob-jectives were: (1) to determine the methods em-ployed by water treatment facilities to measure ployed by water treatment facilities to measure turbidity, color, and odor in water; (2) to estimate the variability of measures obtained routinely by the most commonly employed methods; and (3) to relate combinations of measured turbidity, color, and odor values to public acceptability of drinking water. The main end-products of the study were a set of cumulative distributions of water quality set of cumulative distributions of water quality measurements and a family of water quality ac-ceptance curves for combinations of turbidity, color, and odor values throughout the full range of public acceptability. (Bell-Cornell) W75-12054

PROCESS AND APPARATUS FOR RECOVERING CLEAN WATER AND SOLIDS FROM DILUTE, AQUEOUS, SOLIDS CONTAINING SOLUTIONS OR DISPERSIONS, Hanover Research Corp., East Hanover, N.J. (assignee). For primary bibliographic entry see Field 5D. W75-12059

GENERAL ASPECTS OF WATER SUPPLY AND

GENERAL ASPECIS OF WATER SUFFLY AND TREATMENT IN ONTARIO, MacLaren (James F.) Ltd., Willowdale, (Ontario). T. W. Lumsden, and W. L. C. Knowles. Canadian Journal of Civil Engineering, Vol. 2, No. 2, p 154-161, June, 1975. 2 fig, 3 tab, 8 ref.

Descriptors: *Reviews, *Water treatment, *Water supply, Great Lakes, Turbidity, Treatment facilities, Potable water, Rivers, Groundwater, Aeration, Pre-treatment, Urbanization, Canada, tion, Pre-treat
*Water sources. Identifiers: *Ontario.

Water supply sources in Ontario, Canada, are described. Within the province, water sources to be treated include the Great Lakes, southern Ontario rivers and groundwater, and northern rivers and lakes. Each area has its own set of problems of acquisition and treatment of water. Differences include hardness, turbidity, color, chemical composition, and biological and bacteriological con-tent. The effects of industrial expansion and ur-banization are also discussed. Current trends in improvement of Great Lakes treatment facilities include pre-treatment with polymers, improving mixing and flocculation, adapting filters to high-rate service, and increasing hydraulic capacity of associated piping. River sources of potable water, particularly in southern Ontario, must be treated for turbidity, chlorides, hardness, dissolved solids, and for removal of algae and phenolic substances. Intensive treatment involves prechlorina-tion; screening; superchlorination and dechlorination with ammonia and sulfur dioxide; taste and odor control with activated carbon; aeration; coagulation with alum and activated silica; pH coagulation with alum and activated silica; pH control with calcium carbonate; sedimentation; filtration; postchlorination; postammoniation; and fluoridation. Groundwater obtained from aquifers in both northern and southern Ontario must be treated to remove entrained gases, which cause odor, taste, and corrosion problems. Acration followed by filtration removes iron and manganese and the unwanted gases, while most well supplies are chlorinated. (Kramer-FIRL) W75-12067

WATER-TREATMENT SLUDGE FILTRATION

STUDIES, Auburn Univ., Ala. Dept. of Civil Engineering. For primary bibliographic entry see Field 5D. W75-12069

OPERATIONAL VARIABLES AND LIMITA-TIONS OF DIRECT FILTRATION.

Ontario Ministry of the Environment, Toronto. Pollution Control Branch.

W. R. Hutchison. Research Report No. W54, January, 1975. 118 p, 14 fig, 35 tab, 42 ref, 29 append.

*Water treatment, *Filtration, Descriptors: Suspended solids, Coals, Efficiencies, Separa-tion techniques, Water quality control, Diatoms, Polymers, Polyelectrolytes, Algae, Pilot plants. Identifiers: *Direct filtration, Alum, Ferric chloride, Filter breakthrough.

Some of the operating limitations of water treat-ment by direct filtration during periods of raw water turbidity greater than 20 Ftu or diatom levels of 500 Asu/ml are described and the results of a pilot plant study on the effect of various operating variables are presented. The lengths of filter runs vary inversely with the suspended solids loadings excluding algae. Alum was the dominant factor in determining the overall filter run length. Alum and ferric chloride produced similar quality effluent. Cationic polyelectrolytes lowered the alum requirements. If diatoms were absent, the best ef-fective size of coal, with respect to effluent quali-

ty, length of filter runs, and floc distribution within the filter bed, was approximately 1.05 mm. In dual media filters, effluent turbidity was not a function of the effective size of the coal within the size range from 0.9 to 1.55 mm. The optimum headloss distribution for maximizing filter runs was about 75% for coal and 25% for sand. Diatom levels as low as 200 Asu/ml changed the headloss distribution within the filter bed. Filter coal with an effective size of 1.5 mm operated with diatom levels averaging 2500 Asu/ml produced filter runs longer than 12 hours at 4 Igpm/sq ft. The chance of inter treather of the coal or sand, the alum dosage, the filtration rate, the floculation gradient above 20/sec and the flocculation time to more than 10 minutes, or by decreasing the depth of media. Polymers prevented breakthrough on all madia sizes up to 1.55 mm under all conditions tested. An increase in the pH resulted in a deteri-oration of the final effluent quality. (Orr-FIRL) W75-12127

TREATMENT PLANT TO BE TESTED FOR CARCINOGENS,

Western Kentucky Univ., Bowling Green. Dept.

of Engineering Technology. J. R. Riney, and D. R. Rowe. Water and Sewage Works, Vol 122, No 5, p 110-112, May, 1975. 2 fig, 2 tab.

Descriptors: *Water treatments, *Municipal water, *Water supply, Public health, Waste water treatment, *Pollutant identification, Wells, Water quality standards, Treatment facilities, Filtration, Aeration, Chlorination, Kentucky. Identifiers: *Carcinogens, Well water supply.

EPA plans to test eighty public water supplies including Owensboro, Kentucky's water system for the presence of potentially carcinogenic organic compounds. The city is located on the Ohio River and has a rapidly expanding population of over 50,000. Owensboro does not use the Ohio River as its raw water supply source, but draws from twen ty-six wells that are about 150 feet deep and penetrate an extensive aquifer that parallels the river. Existing and proposed methods of treatment for the city's water treatment plant are discussed. Present treatment involves aeration, coagulation, sedimentation, rapid sand filtration, and chlorina-tion. The chemical composition of the finished water supply meets Federal and Kentucky Drinking Water Standards. However, the system will be improved with a ten mgd reactor-clarifier, which will combine flash mixing, flocculation, and primary sedimentation into one tank. Increased effi-ciency has also been achieved by split treatment to remove all of the magnesium and calcium hard-ness, which is particularly important for well water supplies such as these. Other additions to water supplies such as these. Other additions to the Owensboro treatment plant include new filtra-tion units, a control building facility, and a renovated lime sludge waste system. (Kramer-FIRL) W75-12130

FACTORS AFFECTING OXYGEN TRANSFER DURING BUBBLE AERATION UNDER LABORATORY SCALE CONDITIONS, Iowa Univ., Iowa City. For primary bibliographic entry see Field 5D. W75-12144

UNUSUAL FEATURES IN PLANT DESIGN. Water and Sewage Works, Vol 122, No 6, p 80-81,

Descriptors: *Water treatment, *Treatment facilibescriptors: water treatment, Freatment facilities, *Municipal water, Rivers, Water supply, Water purification, *Flocculation, Monitoring, Automation, Control system, Alabama, Water quality standards, Waste water treatment. Identifiers: Jackson(Ala). The city of Jackson, Alabama, has designed a new water purification plant with a capacity of two mgd. The municipal water supply source is the Tombigbee River, along which industrial expan-sion is expected. The new industries--chemical and paper mills--will be expected to meet strict Alabama water pollution standards. The water treatment plant will have several unique features. Flocculators were designed for flexibility by building four units with vertical paddles, rather than the traditional two horizontal units. The LIGHTNIN model 34Q2 mixers with flocculating turbines also have variable speed control. River clarity changes often, and this variability is needed to keep solid particles properly suspended. Conical diffusers control the flocculating water as it enters the settling basin. Mud-laden water is trapped by these diffusers where the water loses velocity and dumps most of the mud at one end of the tank. Water conditions, from raw inflow to finished water, are automatically monitored from remote w75-12146

CONTROL SYSTEM FOR SHOWA WATER PURIFICATION PLANT, (IN JAPANESE), Y. Harashima, H. Watanabe, H. Komatsu, and Y.

Terauchi. Toshiba Review, Vol 30, No 6, p 499-503, June, 1975. 12 fig, 1 tab. (English summary).

Descriptors: *Treatment facilities, *Water treatment, *Computers, *Filtration, *Precipitation(Chemical), Urbanization, Water supply, Groundwater, Monitoring, Instrumenta-

Identifiers: Chemical treatment, *Japan.

The Showa Water Purification Plant, on the River Edo, Japan, is described. A facility with a water supply capacity of 350,000 cu m/day has been built in the Saitama Prefecture in order to meet an increase in water demand associated with urban growth and a decrease in goundwater resources from pumping. The treatment process involves precipitation, filtration, and sterilization. Com-puter control is implemented, for chemical injection and control of water flow. If the computer system is inoperable, a backup system of auto-matic analog control may be used. The facility has been in satisfactory operation for one year since its construction. (Kramer-FIRL) W75-12147

PRIMARY SOLIDS/LIQUID SEPARATION. For primary bibliographic entry see Field 5D. W75-12153

BEET SUGAR PROCESSING POINT SOURCE SUBCATEGORY-EFFLUENT CUIDELINES AND STANDARDS.

Environmental Protection Agency, Washington, D.C.

For primary bibliographic entry see Field 5G. W75-12271

THE \$5 BILLION FLUSH. For primary bibliographic entry see Field 5D. W75-12277

INTRODUCTION OF \$433 (BILL FOR SAFE DRINKING WATER). For primary bibliographic entry see Field 6E. W75-12280

PROCESS FOR RAW WATER CLARIFICA-

American Cyanamid, Stamford Conn. (assignee). American Cyanamid, Stambord Conn. (assignee). H. P. Panzer, and K. W. Dixon. U.S. Patent No. 3,894,944, 6 p. 1 fig. 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1007, July 15, 1975. Descriptors: *Patents, *Water purification, *Water treatment, *Flocculation, *Water quality control, Suspended solids, Chemical reactions, Separation techniques

This invention relates to an improved process for clarifying raw water or natural water derived from rain, snow, rivers, ponds, reservoirs, etc. The water may have suspended particles which affect the clarity of the water and render it undesirable for its intended use. The raw water is clarified when it is treated with an effective amount of a polyquaternary flocculant obtained from the reaction of an epoxy compound and a secondary amine until a solution viscosity of at least 100 centistokes until a solution viscosity of at least fou centistokes at 25 deg. C. is obtained as a 37% solids solution, by weight, based on the cationic portion of the polyquaternary compounds. (Sinha-OEIS) W75-12300

WATER TREATMENT DEVICE, Water Technology Service, Inc., Cleveland, Ohio.

(assignee). H. S. Aber, D. D. Riggs, and J. Lamantia. US Patent No 3,899,410, 5 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 937, No 2, p 628, August 12, 1975.

Descriptors: *Patents, *Water treatment, *Water softening, *Demineralization, Scaling, Screens, Cleaning, Electric currents, Electrical conductance.

An electrical liquid treatment apparatus is described which is used in eliminating the hardness effects of water. A cleaning device used with the apparatus removes undesirable mineral deposits from surfaces. Another object of the invention is to treat liquid to prevent scale and other mineral formation in liquid systems. The apparatus includes an enlarged fitting adapted for coupling in a flow line and a insultated screen supported in the fitting. An electric potential is applied between the screen and the fitting. A cleaning device having sharp edges is positioned in the fitting to clean mineral and other devices deposits from the creen. (Sinha-OEIS) W75-12305

SALT RECOVERY SYSTEM, For primary bibliographic entry see Field 5B. W75-12306

RECIRCULATING RESIN CLEANING CHEMI-CAL FEEDER SYSTEM FOR WATER SOF-

For primary bibliographic entry see Field 3D. W75-12307

IRON AND MANGANESE REMOVAL WITH OZONE. PART II

OZONE. FART II R. R. Furgason, and R. O. Day. Water and Sewage Works, Vol 122, No 7, p 61-63, July, 1975. 5 tab, 8 ref.

Descriptors: "Ozone, "Municipal water, "Iron, *Manganese, Oxidation, Pilot plants, Water treat-ment, Potable water, Capital costs, Operating costs, Public Health, Idaho. Identifiers: Public Health Drinking Water Stan-dards, Moscow (Idaho).

Iron and manganese removal using ozone oxidation was demonstrated in a pilot study at the Moscow, Idaho, municipal water system. Iron and manganese were effectively oxidized to an insolumanganese were effectively oxidized to an insolu-ble form which could be filtered from water. Raw water with iron and manganese concentrations of 9.5 and 1.2 mg/liter, respectively, was treated with ozone at a dosage of 8.8 mg/liter. This removed all the Fe and Mn to below Public Health Drinking Water Standards. At an ozone dosage of 6.3 mg/liter, the iron was removed, but a 0.1 mg/liter residue of Mn remained. Complete oxidation of

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both minerals involved a reaction time of 30 seconds. When compared to other methods, the capital investment costs of the ozone treatment gallons was competitively low. (Kramer-FIRL)

ANALYSIS OF REVERSE OSMOSIS FACILI-TIES, GREENFIELD, IOWA. B. W. Knowles.

National Waste Supply Improvement Association Journal, Vol 2, No 2, p 29-34, July, 1975. 2 fig, 2

Descriptors: *Reverse osmosis, *Water treatment, Water supply, Wells, Pumps, Instrumentation. Water quality control, Maintenance, discharge, Iowa, Waste water treatment.

The DuPont Permasep B-9 system for reverse osmosis treatment has been implemented in Greenfield, Iowa, since 1971 as an auxillary water supply from previously useless raw well water. This is first reverse osmosis facility to have been built for municipal use. The system consists of three separately controlled units, each containing 24 parallel mounted permeators, a high pressure multistage centrifugal pump, and necessary instrumentation, hardware, and piping. Water quality for the three years of operation has been significantly better than the recommended 500 ppm TDS. Maintenance involves cleaning iron precipitate built up on the membranes, if and when pressure drop exceeds 50 psi. Brine disposal is achieved by discharge to a storm sewer. Operational costs are approximately \$30.30 per 1000 gallons, excluding amortization. (Kramer-FIRL) amortizatio W75-12320

CLEARWELL QUALITY DOESN'T LAST.

Sioux Falls Water Dept., S. Dak. I. I. Hash

The American City, Vol 90, No 5, p 56-57, May,

Descriptors: *Distribution systems, *Bacteria, Water, Odor, Taste, Conduits, Iron, Pipes, Corrosion, Chlorination, Aeration, Adsorption, Activated carbon, Nitrogen, Phosphorus, *Water

Identifiers: Organic carbon, Bacterial growth, Ozonation, Potassium permanganate, Bacterial

Problems in a water distribution system can be indicated by red water, cloudy water, and taste and odor complaints. These problems may be caused by bacterial action. The accumulation of flocculation of iron can be intensified by bacterial growth and can occasionally be dislodged during periods of high velocities in the mains. An undesirable taste similar to that of stagnant water can also be caused by an accumulation of bacterial growth. Depletion of oxygen or destruction of chlorine residuals can occur when certain species of bac-teria are present. Accumulations of bacteria in unlined cast iron pipes can serve to inhibit or accelerate corrosion, depending on the extent and nature of the accumulation. Increases chlorination and lowered pH is an obvious answer to extensive bacterial growth. Organic carbon, nitrogen, and phosphorus are necessary for bacterial growth. Organic carbon appears to be the limiting nutrient in the distribution system. Aeration, ozonation, addition of potassium permanganate, or adsorp-tion on activated carbon could accomplish the removal of a carbon source during treatment Nitrogen and phosphorus sources should be added to water only after their assessment as potential to water only after their assessment as potential bacterial growth stimulators. The same care should be taken prior to adding sulfuric acid as a pH control after softening to the finished water. (Dean-FIRL) PRESSURE CONTROL IN A MOUNTAIN AREA WATER SYSTEM.

For primary bibliographic entry see Field 8C. W75-12343

WATER PLANT GOES AUTOMATIC, Iowa City Water Superintendent Office. For primary bibliographic entry see Field 8C. W75-12345

AERATION UPGRADES RESERVOIR, Escondido Mutual Water Co., Calif.

R. S. Harper.

Water and Sewage Works, Vol 122, No 6, p 40-41, June. 1975.

Descriptors: *Reservoirs, *Aeration, *Dissolved oxygen, Hypolimnion, Reservoir evaporation, Turnovers, Upwelling, Odor, Taste, Water treatment, Mixing, Hydrogen sulfide, California

Identifiers: *Lake Wohlford reservoir(Calif).

A compressor-operated aeration system has been decreasing the hydrogen sulfide concentration and increasing the dissolved oxygen content in the Lake Wohlford reservoir in California since the mid-1960s. The installation consists of a Schramm Model 210 Compressor connected by a 2 in gal-vanized pipe to a 1 1/2 PVC pipe that reaches 40 ft deep into the lake at the hypolimnion. This pipe ends with 20 ft sections, each perforated with 30 holes to release the compressed air. The aeration system is designed to operate at 22 psig, with a volume of 210 cfm. Air leaving the openings forms into bubbles which rise to the surface. Oxygen is into outbies which rise to the surface. Oxygen is dissolved at the interface of each air bubble and its surrounding water. The mass of rising bubbles creates a boiling effect on the surface. Water, no longer supported by the jet, flows outward 360 degrees around the boil pattern. The dissolved oxdegrees around the bold patern. The dissorted ygen picked up at the water/atmosphere interface is about equal to the amount assimilated from the compressed air bubbles. The major factors which determine the overall mixing time are the expanse of the compressed air column and the duration of the compressor operation. The boil column at Lake Wohlford is about 0.7 acres after a 30 hr compressor run. The aeration system has reduced the chlorine dosage necessary to treat the water for drinking, has reduced evaporation resulting in a saving of 35 acre feet of water, and has increased oxygen content. (Orr-FIRL)
W75-12346

PROCEEDINGS OF THE ANNUAL CON-FERENCE OF THE BRITISH COLUMBIA WATER AND WASTE ASSOCIATION. April 9-11, 1974. Conference held at Vancouver, B. C. 272 p

Descriptors: *Waste water treatment, *Potable water, *Water supply, Water resources, Groundwater, Sewage, Irrigation, Disinfection, Pumps, Chlorination, Standards, Water quality, *Canada,

Identifiers: Horizontal groundwater collectors.

The 1974 annual conference of the British Columbia Water and Waste Association was held in Vanbia Water and Waste Association was held in Van-couver, British Columbia, during April 1974. Papers were delivered on the topics of: water resources; water rates; pump selection; water supply; role and responsibilities of the Environ-mental Protection Service (Canada); horizontal groundwater collectors; and oil spill technology. Actual treatment methods discussed included dis-infection, alternatives to disinfection, nackage infection, alternatives to disinfection, package treatment plants, and spray irrigation of sewage. A panel discussion was held on the Canadian Drink-ing Water Standards and objectives with respect to the programs carried out by the provinces to insure that they are providing suitable drinking water to their residents. (See W75-12351 thru W75-12359) (Orr-FIRL) W75-12350

DISINFECTION TO PROTECT RECREA-TIONAL AREAS AND POTABLE WATER SUP-

British Columbia Dept. of Health, Vancouver. Occupational Health Div. For primary bibliographic entry see Field 5D. W75-12351

MUNICIPAL SEWAGE TREATMENT TO PRO-TECT SHELLFISH GROWING WATERS, Environmental Protection Service, Vancouver (British Columbia). Pacific Region. For primary bibliographic entry see Field 5D. W75-12352

CANADIAN DRINKING WATER SURVEIL-LANCE PROGRAMS, PANEL DISCUSSION, Nova Scotia Dept. of Public Health, Halifax. Div. of Public Health Engineering.
For primary bibliographic entry see Field 5G.
W75-12355

CANADIAN DRINKING WATER STANDARDS REVIEW, ONTARIO'S PROGRAMS, PANEL DISCUSSION,

Ontario Ministry of the Environment, Toronto. Contingency Planning Section.
For primary bibliographic entry see Field 5G. W75-12356

CANADIAN DRINKING WATER STANDARDS REVIEW, ALBERTA, SASKATCHEWAN AND MANITOBA, PANEL DISCUSSION, Department of the Environment, Edmonton (Alberta). Div. of Pollution Control. For primary bibliographic entry see Field 5G. W75-12357

CANADIAN DRINKING WATER STANDARDS REVIEW, BRITISH COLUMBIA, PANEL REVIEW, BRITISH COLUMBIA, PANEL DISCUSSION, British Columbia Dept. of Health, Vancouver. En-

vironmental Engineering Div. For primary bibliographic entry see Field 5G. W75-12358

CANADIAN DRINKING WATER STANDARDS REVIEW, NORTHWEST TERRITORIES AND YUKON TERRITORY, PANEL DISCUSSION, Environmental Protection Service, Edmonton (Alberta). Northwest Region. For primary bibliographic entry see Field 5G. W75-12359

THE FLOATING COVER: BEST WAY TO COVER A FINISHED-WATER RESERVOIR. G. Dellaire.

Civil Engineering, ASCE, Vol 45, No 6, p 75-79, June, 1975. 4 fig.

Descriptors: *Reservoir storage, *Storage tanks, *Deterioration, *Air-water interfaces, Potable water, Municipal water, Water quality standards, Pollution, Reservoir operation, Water supply, Chlorination, Comparative costs.

Identifiers: *Reservoir covers, Floating reservoir

Federal and state governments are increasing pres-sure on municipalities to protect the quality of treated water by covering their distribution reservoirs. Often contamination from bird and animals wastes, dust, airborne hydrocarbons, and odor-causing algae is introduced into treated water in uncovered finished-water reservoirs. Many states require covers on all new reservoirs. Covering older reservoirs can be expensive, but costs are offset by a decreased need for treatment chemi-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

cals and for reservoir cleaning and maintenance. Rigid columnrsupported concrete, wood, or steel roofs and aluminum geodesic domes are expensive to construct and leave on air space above the water. Unless space is well ventilated escaping chlorine gas may attack steel and concrete covers; water vapor built up in the space can rot wooden roofs. Occasionally these heavy structures have been descructive to older reservoirs not designed to support the weight. A 45-mil floating plastic cover is less costly to purchase, install, and maintain, and though this type of cover is relatively new and untried, studies suggest that they should new and untried, studies suggest that they should last from 25 to 40 years. Since no air space exists above the water, algae cannot grow there and chlorine gas does not escape from the finished water which allows a smaller chlorine dosage. The major drawback of floating covers is the reservoir cannot be drained, inspected and repaired since the cover rides down with the water and covers the bottom. Scuba divers to do occasional inspecting, cleaning and patching while water remains in reservoir are an expensive alternative. (Herr-North Carolina) W75-12360

5G. Water Quality Control

ACID MINE DRAINAGE IN CANE CREEK BASIN, NEAR OAKMAN, WALKER COUNTY.

Geological Survey of Alabama, University. L. W. Hyde.

Geological Survey of Alabama, Circular 64, 1970, 19p. 7 fig. 1 tab. 3 ref.

Descriptors: *Acid mine water, *Mine acids, *Acidic water, *Acid streams, Water pollution, Mine drainage, Mine water, Waste water, Pollution, Coal, Strip mine wastes, Strip mines, Spoil banks, *Alabama, Water pollution control. Identifiers: *Iron sulfides, *Sulfuric acid, Cane Creek(Ala), Walker County(Ala), Oakman(Ala).

Acid drainage results from the passage of water over and through strata or spoil piles that are high in sulfide minerals. The oxidation of sulfide minerals in the presence of water forms sulfuric acid and releases its products to nearby streams. The iron sulfide minerals are generally associated with the rocks above and below the coal seam. vain the rocks above and below the coal seam. Cane Creek, throughout its length of 14 miles, changed from a neutral stream to a very acidic stream, to a less acidic stream, and then back to a neutral stream (pH ranged 8.0 to 3.0). Close correlation between low stream stage and high pH of the water was found. Acidic water shortens the life of ordinary metals and concrete used in construction. The water is not suitable for municipal or in-dustrial use without extensive treatment, and is unsatisfactory for recreational use. Tests were made to determine the resistance of materials used for road culverts to acidic waters. Control of acid drainage is complex and often economically im-practical. No single method has been entirely relia-ble but several measures are presented. W75-11871

SEATTLE PROJECT CALLS FOR ROCK WEIRS.

For primary bibliographic entry see Field 4A. W75-11922

THE MANAGEMENT OF WATER IN NORTHERN IRELAND, WITH PARTICULAR REFERENCE TO WATER POLLUTION, R. Spence, and M. G. W. Bell. Water Pollution Control, Vol 72, No 1, p 10-19, 1973. 1 fig, 4 tab, 11 ref.

Descriptors: *Water quality, *Water supply, Water pollution, Effluents, Surface waters, Rivers, Sampling, Public health, Data collections, *Pollutant identification. Identifiers: *Ireland, Coastal waters.

Water quality data relating to the surface and coastal waters of Northern Ireland are ar present very limited. However, the Department of Indusand Forensic Science (DIFS), Ministry of Commerce, has since 1949 undertaken numerous water quality examinations over much of the province in relation to specific incidents or ef-fluent disposal problems. The Fisheries Con-servancy Board and Foyle Fisheries Commission also have developed considerable knowledge of pollution problems in Northern Ireland, as have the public health authorities. In order to obtain the necessary data, water quality sampling stations are being established throughout the country, which has been divided into seven hydrometric areas. The stations are situated on tributaries and at the mouths of major rivers and in relation to principal discharges or areas of special interest for amenity er purposes. Each station is calibrated to ensure that any sample from it is representative of the river water quality in the emmediate vicinity. (Sandoski-FIRL) W75-11939

EXPERIMENTS WITH UNCONVENTIONAL STORM OVERFLOWS,
Loughborough Univ. of Technology (England).

For primary bibliographic entry see Field 5D. W75-11940

WATER RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF WYOMING, MONTANA, AND NORTH DAKOTA, 1975.

Survey, Denver, Colo. Water Geological Resources Div. For primary bibliographic entry see Field 5A. W75-11961

EFFICIENCY OF MEASURES FOR THE SANI-TARY PROTECTION OF SURFACE WATERS IN THE REGION OF CHEMICAL INDUSTRY

ENTERPRISES, (IN RUSSIAN), Gorkovskii Meditsinskii Institut (USSR). I. I. Belyaev, and M. P. Gracheva. Gig Sanit, Vol 5, p 13-16, 1974.

Descriptors: Chemical wastes, *Industrial wastes, Effluents, Liquid wastes, "Water pollution con-trol, Sanitary engineering, Streams, "Water pollu-tion treatment, Waste water treatment.

Data from long-term observations on the composition of effluents and the sanitary state of a stream into which liquid wastes of several chemical industries were discharged are presented. A successful field experience in diminishing the amount of discharge wastes is reported. The sanitary measures that have been carried out for the last few years are discussed.--Copyright 1975, Biological Abstracts, Inc. W75-11977

OBSERVATIONS OF THE GUPPY, POECILIA RETICULATA PETERS, IN CULEX PIPIENS FATIGANS BREEDING SITES IN BANGKOK, RANGOON, AND TAIPEI, Maryland Univ., College Park. Dept. of Entomolo-

gy. E. C. Bay, and L. S. Self. Bull W H O, Vol 46, No 3, p 407-416, 1972.

Descriptors: *Asia, Public health, Mosquitoes, *Human diseases, Organic wastes, Water pollution, Cities.

Identifiers: Bangkok, *Culex-Pipiens-Fatigans, Guppy, *Mosquito control, *Poecilia-Reticulata, Rangoon, Taipei, *Wuchereria-bancrofti.

The successful establishment of the guppy in a number of shallow, highly polluted ground pools beneath low income housing in Bangkok, Thailand was previously reported. Whether Bangkok guppies evolved a higher tolerance to organic pollu-tion than P. reticulata that had never been exposed to these conditions was questioned; the possibili-ties of using these fish elsewhere to control C. pipiens fatigens (especially in Rangoon, Burma, and Taipei, Taiwan) where this mosquito is the vector of Wuchereria bancrofti which affects hu-mans are discussed.--Copyright 1973, Biological Abstracts, Inc. W75-11989

SYSTEMS APPROACH TO HYDROLOGY. For primary bibliographic entry see Field 2A. W75-12014

THE ASSESSMENT OF WATER QUALITY, Anacapa Sciences, Inc., Santa Barbara, Calif. For primary bibliographic entry see Field 5F. W75-12054

COAL MINE DRAINAGE POLLUTION-1973, Pennsylvania State Univ., University Park. Mine Drainage Research Section. Harold L. Lovell. Earth and Mineral Sciences, Vol. 42, No. 52, p. 54-

55, 1973, 28 ref.

Descriptors: *Mine drainage, *Coal mines, *Water pollution control, *Water pollution treatment, Legislation, Research and development, Methodology, Acid mine water, *Pennsylvania. Identifiers: Coal mine drainage.

The steps taken and the progress made through legislation, research, and action programs toward cleaning up streams polluted by mine drainage are summarized. Pennsylvania, other coal-producing states, and Congress have passed legislation which curtails stream debasement by mining. Quality specifications have been set for water discharge and acceptable mining procedures. Pennsylvania has instigated the design and operation of a mobile treatment pilot plant and construction of a fullscale Experimental Mine Drainage Treatment Facility, which utilized chemical neutralization procedures; distillation, ion exchange, reverse osmosis have also been studied in prototype installa tions. Corrective and preventive measures helpful in current strip mining operations include temporary water treatment using soda ash, drainage control, slope control, shortened land-disturbance intervals, and rapid revegation. Better coal refuse disposal now minimizes both water and air pollution. Several hundred facilities now treat drainage from active mines. The cost and process ad-vantages of limestone when combined with biochemical iron oxidation have been demonstrated. The areas of current concern are control of drainage formation, correction of areas blighted by abandoned mines, improved treatment reliability and control with reduced labor requirements. The reverse osmosis process appears to be the most feasible for obtaining the higher purity levels but remains to be proven by time. (Auen-Wisconsin) W75-12114

SODIUM HYDROXIDE TREATMENT OF ACID MINE DRAINAGE,

Environmental Protection Agency, Rivesville, W. Va. Croion Mine Drainage Control Field Site. J. L. Kennedy. EPA National Environmental Research Center,

Cincinnati, Ohio. Office of Research and Monitoring, Report February 1973. 8 p, 1 fig, 4 tab, 3 ref.

Descriptors: *Mine drainage, *Alkalis(Bases), *Waste water treatment, *Sodium compounds, *West Virginia, Application methods, Water purification, Flocculation, Water Slurries, Comparative costs. Identifiers: *Sodium hydroxide. Flocculation, Water quality, Sludge,

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

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A sodium hydroxide solution was used to lower acidity and remove some of the chemicals in small mine-drainage flows in remote locations and its ef-ficiency evaluated. The feeding device used was easily moved, required no electricity, needed very little maintenance, and was relatively simple to operate. The sodium hydroxide system maintained effluent pH between 6.6 and 7.6 and removed acid. iron, and aluminum regardless of the wide variance of water flow (from 13 gpm to 108 gpm). The cost for sodium hydroxide was considerably higher, however, than treatment by lime, limestone, or soda ash of similar water. But costs may be economically comparable as power and large storage hoppers are needed to reliably feed lime, limestone and soda ash, and these materials are difficult to keep in slurry. Baffles or similar arrangements are needed to ensure good mixing of the sodium hydroxide and the acid mine drainage after the effluent leaves the measuring flume. A settling pond to collect solids is recommended in all cases where the raw acid mine drainage contains more than 20 to 30 ppm of acidity because of the iron and aluminum precipates that would be formed. (Auen-Wisconsin) W75-12116

STRONG IMPACT OF TEXTILES BY U.S. WATER CONTROL ACT, L. C. Woodall, and T. A. Alspaugh.

Modern Textiles, Vol 54, No 2, p 12-13, 20-21,

Descriptors: *Pollution abatement, *Water pollution control, *Textiles, Industries, Economic impact, Regulation, Standards, Waste treatment, Costs, Federal Water Pollution Control Act, Optimization, Legislation, Air pollution, Waste disposal, Environment, Incineration. Identifiers: *Textile industry, Zero discharges,

Noise limitation.

W75-12117

IM

The chairmen of the panel on Textile Manufacturers at the First International Pollution Engineering Conference held at Cleveland on December 4-7, 1972 summarize the highlights of the contributing papers. The provisions of the Federal Water Pollution Control Act Amendments of 1972 were considered too stringent in their objective of zero discharges as based on a cost/benefit analysis; specifically the cost for eliminating the remaining pollutants above 85-90% may be as high as the first 85-90%. It was hasized that the costs of resources-energy, steel, coal, aluminum, etc.,-to remove 95-99% pollutants would be outbalanced by the benefits of total pollution control. The costs of waste treatment by municipal or joint municipal-industry operations, plus plant pretreatment costs, seem to favor total treatment by each individual plant. Other subjects discussed were noise control, environmental control programs, air pollution from vironmental control programs, air poliution from drying and curing ranges, discharge of toxic sub-stances, employee health and safety and solid waste disposal; and the problems of new plant designs to meet acceptable environmental stan-dards, which deplorably are not static. (Auen-Wisconsin)

POLLUTION OF GROUNDWATER DUE TO MUNICIPAL DUMPS, Department of the Environment, Of (Ontario). Inland Waters Directorate. For primary bibliographic entry see Field 5B. W75-12119 Environment, Ottawa

HYDROGEOLOGICAL ASPECTS OF SOLID WASTE DISPOSAL, Wisconsin Univ., Madison. Water Resources

Management Program.

For primary bibliographic entry see Field 5E.

For primar W75-12121

GROUND-WATER GROUND-WATER AND ENGINEERING GEOLOGY IN SITING OF SANITARY LAND-

Illinois State Geological Survey, Urbana For primary bibliographic entry see Field 5E. W75-12122

RECULATORY ASPECTS OF

UTILIZATION ON LAND,
Ontario Ministry of the Environment, Toronto.
Pollution Control Branch.
G. M. Wood.

O. M. Wood. In: Sludge Handling and Disposal Seminar, Conference Proceedings No 2 September 18-19, 1974, Toronto, Ontario, Canada, p 110-119, (1974) 2 tab.

Descriptors: *Regulation, *Treatment facilities. Sites, Management, Organic wastes, Monitoring, Rates of application, Heavy metals, Nutrients, Damages, Compensation, Land, Soil analysis, Canada

Identifiers: Environmental Protection Act(Canada), Guidelines, Crop analysis, Spreading equipment, Haulers.

Regulation 824 of the Environmental Protection Act, in Canada, has been amended to designate and define organic waste processing and establish guidelines for construction and operation of or-ganic waste sites. Haulers will need a Certificate of Approval for hauling and spreading equipment and for the number of sites needed for each sewage treatment plant. Guidelines have been set up for the sites covering location, land characteristics, management, and application rates of processed organic waste. The sites must be moniprocessed organic waster. In a sites must be innoised to the tored for buildup of heavy metals and nutrients by the sampling of soils and crops. It is hoped that these guidelines with built-in safety factors will prevent permanent damage or degradation by the use of sludge on farmland. If damage does occur, due to hauler negligence or to plant errors in processing organic waste quality, the legal respon-sibility and compensation to the individual will need to be determined. (See also W75-11715) (Dean-FIRL) W75-12134

FLOATING AQUATIC PLANTS REMOVE CHEMICALS FROM POLLUTED WATERS, Water and Pollution Control, Vol 113, No 6, p 23, 25. June. 1975. 2 fig.

Descriptors: *Aquatic plants, *Pollution abatement, *Metals, Waste water treatment, Nutrient removal, Absorption, Fermentation, Sewage, *Water hyacinths, Costs, Phenols, Insecticides, Water pollution control. Identifiers: Chemical pollutants, Toxic metals.

NASA's National Space Technology Laboratories (NSTL) in Bay St. Louis, Mississippi has been experimenting with water hyacinths to determine the plant's ability to absorb and concentrate toxic metals, and metabolize other chemical pollutants phenols, creosols, insecticides, nitrates, and phosphates. In early 1975 large quantities of water phosphates. In early 1973 large quantities of water hyacinths were planted in a portion of the 60-acre lagoon that serves as the city's total sewage disposal outlet. The planting begins a complex process that results in the total recycling of enormous quantities of water hyacinths. One month after initial stocking, plant harvesting begins; by this time the plants will have reproduced enough to appreciably reduce pollution levels. The harvested crop is subjected to procedures to determine impurity assimilation. Two methods under study by NSTL involve continual processing of the water hyacinths. Anaerobic fermentation converts shredded water hyacinths into bio-gas, similar to natural gas. The potential yield is expected to be 28,500 cubic meters of gas per acre of plants. Pyrolytic decomposition produces a mixed hydrocarbon fuel similar to bio-gas. Plants grown in domestic sewage effluent (low in toxic metal content) will be evaluated as an animal food

source. Residues from these processes will yield high grade fertilizer. The advantages of the integrated aquatic plant disposal method are durability and low installation and maintenance costs.

An obvious drawback is that it is limited to tropical and subtropical climate zones. (Murphy-FIRL)
W75-12145

MINE DRAINAGE ABSTRACTS, A BIBLIOG-RAPHY. 1972 SUPPLEMENT. Bituminous Coal Research, Inc., Monroeville, Pa. For primary bibliographic entry see Field 5B.

REPORT TO THE CONGRESS ON OCEAN DUMPING RESEARCH, JANUARY THROUGH DECEMBER 1974 PUBLIC LAW 92-532, TITLE II, SECTION 201.

National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-12173

INPUT-OUTPUT ANALYSIS AND THE EN-VIRONMENT. University Coll. of Wales, Aberystwyth. Dept. of

For primary bibliographic entry see Field 6G. W75-12177 Economics

INTERNATIONAL ECONOMICS UNIV. (England). INTERNATIONAL ECONOMICS AND EN-Dept.

For primary bibliographic entry see Field 6G. W75-12178

FILTERING AND DEBRIS REMOVING AP-PARATUS FOR CLEANING A SEA WATER STREAM, H. M. Zuccolotto.

U.S. Patent No 3,896,005, 6 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 4, p 1378, July 22, 1975.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, *Filtration, *Separation techniques, Flotsam, Jetsam, Sea water, Cooling water, Equipment.

A filtering and debris removing apparatus is described for cleaning a fluid intended for circula-tion through the tube bundles of heat exchangers and like equipment in order to completely and efficiently remove the debris without the need of complete stoppage of the plant operation. The ap-paratus provides in addition to a backflushing operation for cleaining the filtering media an efficient scrubbing operation of the surface of the fil-tering media by the action of the feed fluid. The filtering apparatus has a chamber containing a filter which divides the chamber into upstream and ownstream compartments. The debris containing fluid entrance is connected to the upstream com-partment adjacent one end of the filter and has a valve. The service fluid outlet is connected to the varve. The service fund ounce is connected to the downstream compartment. A blowdown pipe is connected to the upstream compartment adjacent the other end of the filter and contains a second valve. (Sinha-OEIS) W75-12183

OCEAN DUMPING OVERSIGHT.

Hearings-Subcomm. on Fisheries and Wildlife Conservation and the Environment and Subcomm. on Oceanography, Comm. on Merchant Marine and Fisheries, U. S. House of Representatives, 93d Cong, 2d Sess, May 1974. 287 p, multiple tab, fig. ref.

Descriptors: *Legislation, *Oceans, *Protection, *Waste dumps, *Administrative agencies, Ad-

ministration, Waste disposal, Environmental en-gineering, Sanitary engineering, Wastes, Federal Government, Legal aspects, Water law, Conservation, Control, Preservation, Research and development, Dredging, Spoil banks, Water, En-vironmental effects, Water injury, Water pollu-tion, Water pollution control, water pollution

Identifiers: *Congressional hearings, *Marine protection, *Marine Protection Research and Sanctuaries Act of 1972, Coastal waters, Environmental policy, Hazardous substances(Pollution), International agreements, Territorial waters.

These hearings were held in order to review the ac-tivities of the various federal agencies charged with responsibility for carrying out the Marine Protection, Research, and Sanctuaries Act of 1972, also known as the Ocean Dumping Act. The purpose of the Act is to impose strict controls upon the dumping of waste materials into the oceans and seas of the world. Basic responsibility for enforcement of the act is vested in the Environmental Protection Agency, which has the ul-timate power to review and control all dumping activities over which the United States has jurisdiction. Research responsibilities and the power to establish marine sanctuaries is delegated to the estations marine sanctuaries is delegated to the Department of Commerce, through the National Oceanic and Atmospheric Administration. The Corps of Engineers is responsible for dredge and fill activities, and the Coast Guard is responsible for monitoring and supervision of dumping activities. ties. Representatives of all these agencies were present and discussed their progress under the Act. Additional testimony was received from public witnesses such as the National Wildlife Federation. (Fernandez-Florida) W75-12194

BIG CYPRESS NATIONAL PRESERVE (PART

For primary bibliographic entry see Field 6G. W75-12195

DEEPWATER PORT ACT OF 1974.

Joint Report--Comms. on Commerce, Interior and Insular Affairs, and Public Works, U. S. Senate Report No 93-1217, October 2, 1974. 106 p.

Descriptors: "Harbors, "Legislation, "Offshore platforms, "Oil industry, "International waters, Water pollution sources, Deep water, Oil, Oil pollution, Water pollution, Oil spills, Oil wastes, Environment, Environmental effects, Transportation, Federal Government, Ships, Public health,

Structures, Regulation.
Identifiers: *Hazardous substances (Pollution),
*Licenses, Class action suits, Environmental pol-

This is a joint report on the Deepwater Port Act of 1974 by the Committees on Commerce, Interior and Insular Affairs, and Public Works. The purpose of the Act is to establish a licensing and regu-latory program governing offshore deepwater port development beyond the territorial limits and off the coast of the United States. Such facilities would be used to transfer oil and natural gas supwould be used to transfer oil and natural gas sup-plied transported by tanker to and from the United States. Economic and environmental advantages associated with super tankers and deepwater ports are to be utilized by means of this federal legisla-tion. The construction and operation of deepwater ports off the coast of the United States promises to reduce oil pollution damage to the marine en-directions to the desired to the coast of the c vironment by reducing tanker traffic in congested harbors and ports. Enactment of the Deepwater Port Act of 1974 is recommended by the Committee on grounds that the Nation's interests will be used to the committee on the committee of the Committee on grounds that the Nation's interests will be well served by the construction and operation of west serveu by the construction and operation of such ports. Generally, the report contains the pur-pose and description, background and need, major issues, legislative history, general recommenda-tions, section analysis, cost considerations and ad-ditional views regarding the Act. (Fernandez-Florida) W75-12198

FEDERAL OCEAN PROGRAMS REVIEW For primary bibliographic entry see Field 6E. W75-12200

HIGH SEAS OIL PORT ACT.

Hearings and Report-Comm. on Merchant Marine and Fisheries, U. S. House of Representatives, 93d Cong, 2d Sess, May 15, 1974. 40 p.

Descriptors: *Legislation, *Offshore platforms, *Foreign trade, *Oil industry, *Environmental effects, Oceans, Coastal structures, Coasts, Marine fisheries, Import, Economics, Ecology, Oil, Oil

Insheries, Import, Economics, Ecology, Oil, Oil pollution, Legal aspects, Permits, Regulation, Water law, Administrative agencies, Transportation, Federal Government.
Identifiers: *Congressional hearings, *Licenses, *High Seas Oil Ports Act, Administrative regulations, Coastal waters, Coastal zone management, Environmental policy, Hazardous substances(Pollution).

After consideration of bill H. R. 11951, as amended, the House Committee on Merchant Marine and Fisheries reported favorably and recommended enactment. The purpose of the legislation is to authorize the issuance of licenses to eligible applicants for the construction and operation of high seas oil ports in the offshore coastal waters of the United States, as a means for the unloading and further handling of petroleum and petroleum products for transshipment to the United States. The bill outlines mandatory procedures to minimize adverse impacts on the marine environment, and to protect national, and state, and local interests which would be affected. This legislation seeks to facilitate oil importation in the manner most economically and environmentally desirable. Title 1 authorizes the Secretary of the Interior to issue licenses for construction of high seas oil ports if the Secretary, after consulta-tion with other appropriate federal agencies and departments, determines that the applicant is, in all respects entitled to a license under the various provisions of the Act. Title II deals with the operation of the ports and places responsibility for oversight of operations in the Secretary of the department in which the Coast Guard is operating, and grants authority to promulgate and enforce reasonable rules and regulations. (Fernandez-Florida) W75-12201

1973 IMCO CONFERENCE ON MARINE POL-

LUTION FROM SHIPS. Hearings--Comm. on Commerce, U. S. Senate, 93d Cong, 1st Sess, November 14, 1973. 177 p, 5

Descriptors: *Waste disposal, *Solid wastes, *Leakage, *Treaties, *International law, Water pollution, Water pollution control, Oil spills, Abatement, Sewage, Legislation, Legal aspects, Jurisdiction, Law enforcement, Water resources, Public health, International commissions, International waters, Law of the sea, Oil, Oil pollution, Oily water, Ships.
Identifiers: *Intergovernmental Maritime Con-

sultative Organization, *International Convention for the Prevention of Pollution from Ships, Marine

A report on the 1973 Intergovernmental Maritime Consultative Organization (IMCO) Conference on Marine Pollution from ships was made before the U. S. Senate Commerce Committee. Its purpose was to present to the Committee for approval the new International Convention for the Prevention of Pollution from Ships. The treaty is an extension of a resolution by the IMCO Assembly to completely eliminate the willful and intentional pollution of the sea by oil and other noxious substances and to minimize accidental spills. The treaty governs five types of discharge from ships: oil, noxious liquid substances, harmful packaged goods, sewage and garbage. Some of the specific articles adopted include the imposition of more stringent regulations on the discharge of refined oil products; the adoption of segregated ballast requirements; and, the prohibition of oil discharge within 50 miles of land and within designated special areas, i. e., Baltic, Black, Red and Mediterranean Seas. IMCO evaluated and now regulates almost all of the major liquid substances carried in bulk on the oceans. It indicates the relative hazard to marine resources, human health, and amenities. The treaty is not self executing and will require the enactment of domestic legislation. The treaty provides for international enforcement by the individual adopting countries. (Altuve-Florida) W75-12202

THE FIFTH ANNUAL REPORT OF THE COUN-CIL ON ENVIRONMENTAL QUALITY. Council on Environmental Quality, Washington,

For primary bibliographic entry see Field 6G. W75-12203

USES OF SCIENTIFIC INFORMATION IN EN-VIRONMENTAL DECISION-MAKING, Indiana Univ., Bloomington, School of Law For primary bibliographic entry see Field 6G.

THE DOCTRINE OF PRIMARY JURISDICTION MISCONCEIVED: END TO COMMON LAW EN-VIRONMENTAL PROTECTION,

Florida Attorney General's Office, Tallahassee. For primary bibliographic entry see Field 6G. W75-12206

THE FLORIDA ENVIRONMENTAL PROTEC-TION ACT OF 1971: THE CITIZEN'S ROLE IN ENVIRONMENTAL MANAGEMENT, For primary bibliographic entry see Field 6G. W75-12207

POLLUTION CONTROL UNDER PENNSYLVANIA CLEAN STREAMS LAW, A. Charlson.

A. Charison.
University of Pittsburgh Law Review, Vol XXXIV, No 1, p 115-129, 1972. 15 p, 51 ref.

Descriptors: *Mine drainage, *Mining, *Mine water, *Mine wastes, *Pennsylvania, *Judicial decisions, Waste water disposal, Industrial wastes, Water treatment, Water quality, Water pollution, Penalties (Legal), Legislation. Identifiers: *Due process.

The impact of two recent court cases on the Pennsylvania Clean Streams Law is analyzed in this article. The cases involved interpretation of section 315 of that statue which requires operators of mines to treat polluted water which it pumps from its mines. Mine operators contended that they were only required to treat polluted water discharges from active mines. One case involved water which was pumped from an adjacent mine for the purpose of protecting an active mine. The other case involved water from an inactive mine which commingled with other water and was discharged together with water originating in an active mine. In both cases the Commonwealth Court held that mine operators were not required to treat water which did not originate in an active mine. The article analyzes the Court's interpretation of various statutory language, such as mine, mine drainage, and source. The article also ex-plored the problems of proof and fault and their relation to the constitutional requirements of due process. (Hoffman-Florida) W75-12209

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

RIVER RESTORED: OREGON'S WIL-LAMETTE,

National Geographic Society, Washington, D. C. E. A. Starbird.

National Geographic, Vol 141, No 6, p 816-834, June 1972. 12 p, 1 map, 6 photo.

Descriptors: *Oregon, *Industrial wastes, *Pulp wastes, *Pollution abatement. *Fish ladder. *River regulation, Water pollution, Water pollution sources, Water pollution, Water pollution sources, Water quality, Spawning, Chemical wastes, Pulp and paper industry, Permits, State Government, Regulation, Water pollution effects, Water pollution treatment.
Identifiers: Willamette River (Ore), Permit

systems, Spawning grounds.

Oregon's Willamette River was one of the most polluted waterways in the nation less than a decade ago. The river had become clogged with agricultural, industrial, and human wastes. Finally the public took steps to clean up the river, despite claims from the polluters that the cost of corrective steps would be prohibitive. Astate permit system was passed, without the waivers and vari-ances that have underminded similar efforts. setting quality standards for all liquid discharges and requiring frequent testing of outflows. Pulp and papermakers, once the worst polluters, were required to start installing chemical recovery and required to start instanting thermical recovery and secondary waste treatment facilities. Because of these and other pollution controls, waste discharges have been reduced by 90 percent. Overall water quality has been raised; water-contact sports are again safe; and the number of game tact sports are again sare; and the number of game fish has increased dramatically. Because the fish can once again survive in the Willamette, a 3.7 million dollar fish ladder was constructed to help fish climb the face of a cliff to reach spawning grounds. A program has been set up to keep a constant watch for potential violators.

WASTING A RIVER, California Univ., Berkeley, Coll. of Natural For primary bibliographic entry see Field 6G. W75-12211 Resources.

LITIGATION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS

nental Law Inst., Washington, D.C.

Environmental Law Reporter, Vol IV, p 50109-50122, 1974. 12 p, 139 ref.

Descriptors: *Federal Water Pollution Act, *Judicial decisions, *Jurisdiction, *Pollution abatement, Water pollution, Water quality act, Water pollution treatment, Water law, Waste water treatment, Legislation.

Water deadning, Eggstation.
Identifiers: Federal Water Pollution Control Act
Amendments of 1972, *National Environmental
Policy Act, Injunctive relief, Navigability tests.

Recent litigation arising under the Federal Water Pollution Act (FWPCA) Amendments of 1972 is classified and analyzed. The FWPCA is said to have had three goals: (1) to furnish financial aid for the planning and construction of waste treatment facilities; (2) to regulate the discharge of pollutants into American waterways; and (3) to encourage planning for waste treatment manage-ment. Cases to date have involved only the first two goals, with the bulk of litigation centering on regulation of pollutant discharge. Courts are in agreement that the 1972 Amendments did not repeal prior federal law relating to water pollution control. However, other ambiguities arising under these amendments are not fully resolved. The author includes the controversy over presidential impoundment of appropriated funds among these problems, although she recognizes that the trend in these matters is clearly against the asserted pre-sidential authority. Although most courts have

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ruled that navigability is no longer a jurisdictional requirement in the federal control of water pollution, that issue is not entirely resolved. The question of the notice requirement for citizen suits is still in doubt, as is the issue of whether the citizen suit provision is the exclusive remedy under the Act. A further problem, and one which arises in a variety of contexts, is the degree of discretion enjoyed by the Administrator under the Act. The author concludes that, from an environnet. The author concludes that, from an environ-mentalist's point of view, the decisions today are quite favorable, although with so many issues un-resolved, no final analysis of the court's role is possible. (Gerlach-Florida) W75-12212

DRAFT PROPOSAL FOR LEGISLATION TO CONTROL WATER POLLUTION FROM AGRICULTURAL SOURCES,

R. Piampiano. Cornell Law Review, Vol 59, p 1097-1125 (1974). 29 p. 161 ref.

Descriptors: *Agricultural runoff, *Agricultural chemicals, *Water pollution, *Water pollution control, *Water pollution effects, Water pollution seurces, Agriculture, New York, Pollutant identification, Pollution abatement, Pollutants, Water, Water quality, Water quality control, Toxicity, Nitrogen, Phosphorous, Pesticides, Pesticide toxicity, Plant growth, Soils, Crops, Groundcade toxicity, rlant growth, Soils, Crops, Ground-water, Eutrophication, Wastes, Animal wastes(Wildlife), Fertilizers. Identifiers: Hazardous substances(Pollution), Non-point sources(Pollution), NEPA, Refuse Act of 1899.

Because a great deal of agricultural water pollution comes from so-called 'non-point' sources which are difficult to identify, quantify, and discern, agricultural pollution is less visible to public scruagricultural pollution is less visible to public scru-tiny and concern. However, the volume of agricul-tural pollution suggests that legislative efforts must enter a new phase of development-increased control of specific sources of agricultural pollu-tion. Of the many substances used in agricultural operations which are potential pollutants, three operations which are potential pollutants, three are of primary concern to water quality management: nitrogen, phosphorus, and toxic chemical pesticide residues. When compounds with high concentrations of nitrogen and phosphorus are applied in proper amounts with proper techniques, the result is beneficial to plant growth and soil development. The chemicals become potential pollutants only when the amount applied exceeds the amount which can be used by plants, crops and the soils, because the excess is then available to leach or run off into surface and ground water, resulting in contamination and eutrophication. It is clear that present methods of pollution control fail to take account of the special difficulties involved in regulating the disposal of animal wastes and the regulating the disposal of animal wastes and the use of fertilizers and pesticides. Greater public and legislative awareness of these special problems is required to arrive at an effective plan and appropriate methods of control. (Gagliardi-Florida) W75-12213

THE INTEGRATIVE POTENTIAL OF THE PROPOSED INTERNATIONAL REGIME FOR THE SEABED.

For primary bibliographic entry see Field 6E. W75-12215

WYANDOTTE AND ITS PROGENCY: THE QUEST FOR ENVIRONMENTAL PROTECTION THROUGH THE ORIGINAL JURISDICTION OF THE SUPREME COURT,
Pepper, Hamilton and Schultz, Philadelphia, Pa.
B. W. Ficken.

Dickenson Law Review, Vol 78, p 429-459 (1974). 31 p, 153 ref.

Descriptors: *Jurisdiction, *Judicial decisions, *Mercury, *Ohio, *Federal-state water rights con-

flicts. Constitutional law. Governmental interrelations, Interstate, Common law, Federal jurisdiction, State jurisdiction, Water rights, Legal aspects, Water law, Water pollution sources, Water pollution, Environmental effects, Environ-

Identifiers: *Hazardous substances(Pollution),
*Injunctive relief, *Mercury pollution, Nuisance(Legal aspects).

In Ohio v. Wyandotte Chemicals Corporation the State of Ohio sought to invoke the original jurisdiction of the United States Supreme Court to enjoin Wyandotte from dumping mercury into streams whose course ultimately reached Lake Erie. Although the Court acknowledged its jurisdiction, it declined to exercise it. This comment analyzes the Court's approach to the exercise of its original jurisdiction in light of Wyandotte and three subsequent cases. Particular consideration is given to clarifying those factors which influence the exercise of original jurisdiction. The comment outlines a course of action and arguments for the environmentally aggrieved state seeking to invoke the original jurisdiction of the Supreme Court. The author concludes that unless the action can be properly characterized as a suit between two or more states, an attempt to invoke the original ju-risdiction of the Court will probably be unavailing. (Fernandex-Florida) W75-12218

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972, D. N. Stern, and E. M. Mazze. American Business Law Journal, Vol 12, p 81-86

(1974). 7 p, 22 ref.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Legal aspects, *Pollution abatement, *Navigable waters, Governmental interrelations, Non-structural alternatives, Administerretations, non-structural alternatives, Administration, Industries, Environmental control, Water pollution control, Research and development, Grants, Monitoring. Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Enforcement procedures, *Notice, Monitoring procedures.

Governmental regulation of water pollution has been recognized as a legitimate activity. The apparatus for executing this function developed in a series of legislative acts beginning in 1948 with the creation of the Federal Water Control Advisory Board. The Water Quality Act of 1970 transferred control of water pollution from the Department of Health, Education and Welfare to the Environmental Protection Agency (EPA). In 1972, amendments to the Federal Water Pollution Control Act strengthened federal control in several major areas. Extension of federal jurisdiction to all navigable waters including territorial seas involves a possible violation of the Commerce Clause which has not yet been determined by the Supreme Court. Research programs have been revised. The EPA must now coordinate research efforts with HEW, and the Coast Guard has jurisdiction over research of marine pollution. Grants for construction of public waste treatment have been established. Manufacturers are now required to monitor discharges at point sources of pollution and the records must be made available to the EPA. Specific and immediate enforcement procedures enable the EPA to proceed against a violator when the state where the violation occurs fails to take appropriate action within 30 days of the alleged violation. (Jenkins-Florida) W75-12221

THE RUSH FOR OFFSHORE OIL AND GAS: WHERE THINGS STAND ON THE OUTER CONTINENTAL SHELF.
Environmental Law Reporter, Vol V, No 2, p
10026-10029, February 1975. 4 p, 15 ref.

Descriptors: *Coastal structures, *Drilling, *Offshore platforms, *Continental shelf, Adminis-*Drilling, Descriptors: "Ontsnore platforms, "Continental sheff, Administrative decisions, Zoning, Seashores, Project planning, Alaska, Maine, Cost-benefit analysis, Geological surveys, Oil spills, On-site tests, Path of pollutants, Ocean currents, Submerged Lands Act, Continental margin.

Identifiers: *National Environmental Policy Act,

*Coastal Zone Management Act, *Environmental impact statement.

Leasing of Outer Continental Shelf acreage for oil and gas exploration while to be encourage, con-flicts with the Council of Environmental Quality's 1974 recommendation that site development be al lowed only if environmental risks are outweighed by benefits to be obtained. Onshore processing of the oil and gas presents the major data gaps hampering assessment of onshore environmental im-pact. State participation in safeguarding the en-vironment is encouraged by possible federal fund-ing and National Oceanic and Atmospheric Ad-ministration approval of state coastal programs. The Outer Continental Shelf Lands Act also provides for environmental impact statements, which would be aided by proposed Interior Department data requirements and bidding procedures. The Ford Administration favors immediate developroru Administration lavors immediate develop-ment of offshore resources, even without a com-prehensive national policy. The Energy Supply Act of 1974, which was not enacted, provided development guidelines which might have aided the Administration in this area of development. (Knocke-Florida)

WE'RE FIGHTING OIL POLLUTION WITH BUBBLES, BELTS AND BEADS, B. Ford.

Science Digest, Vol 69, p 34-39, March 1971. 6 p. 4

Descriptors: *Oil spills, *Oily water, *Oil pollution, *Separation techniques, *Oil-water interfaces, Organic wastes, Water pollution treatment, Fuels, Oil wastes, Waste water disposal. Identifiers: *Oil tagging systems, *Oil herding methods, *Microbial degradation.

Various techniques for combating and controlling oil spills are explored in this article. In addition, a brief survey of the history of oil spill cleanups is given. The article describes the various clean-up systems, such as natural detergents, chemical oil herders, and oil and water separation systems, use. These systems, however, are generally adaptable only in calm waters. Two experimental projects are currently under analysis in an attempt to solve the open water problem. One of the projects involves systems designed solely for installation near a final well which would capture leaking oil. The other involves the application of microbial degradation. The idea of a chemical 'recipe' is also described, whereby the oil in a ship's tank can be temporarily turned into a gelatin so that is cannot spill. Finally, since the solution in oil spills seems far away, the article describes a new tagging system. Unlike the current fingerprint method now in use, this method will be able to detect the in use, this method will be able to detect the specific ship responsible for the spill. (Hoffman-Florida) W75-12225

HISTORICAL GUIDE TO FEDERAL WATER POLLUTION CONTROL LAWS AFFECTING

FOOD PROCESSING, Economic Research Service, Washington, D.C. P. M. Emerson.

Available from Superintendent of Documents, U.S. Gov't Printing Office, Wash, DC, as A93.21:543, ERS-543. February 1974. 10 p, 8 ref, 1

Descriptors: *Governmental interrelations, *Federal jurisdiction, *Penalties(Legal), *Food processing industry, Water pollution control,

Water quality standards, Regulation, Water quality, Water utilization, State jurisdiction, History, Economics, Federal Water Pollution Control Act, Water resources development, Rivers and Harbors Act, Law enforcement, Water permits, Local governments.

Identifiers: *Environmental impact statement,

History of federal regulation.

The role of the federal government in controlling water pollution originally emphasized financial support of state programs. Increasing federal con-cern led to the Federal Water Pollution Control Amendments of 1972, and use of effluent limitations and discharge permits. Deadlines for best practicable and best available standards were set of 1977 and 1983 respectively. Plants discharging on 1977 and 1950 respectively. Finants discharging to municipal facilities will be required to satisfy pretreatment standards and pay part of municipal capital and operating costs. The broad goals of current federal statutes are primarily concerned with area-wide management planning and con-tinued assistance of municipal treatment plants. (Knocke-Florida) W75-12226

THE DEEPWATER PORTS ACT OF 1974; HALF SPEED AHEAD,

R. Meltz Environmental Law Reporter, Vol 5, No 3, p 50043-50048, 1975. 6 p, 34 ref.

Descriptors: *Offshore platforms, *Harbors, *Legislation, *Oil industry, *International waters, Water pollution sources, Deep water, Oil, Oil polution, Water pollution, Oil spills, Oil wastes, Environment, Environmental effects, Transportation, Federal government, Ships, Public health, Structures, Regulation.
Identifiers: *Hazardous substances(Pollution),

Class action suits, Environmental policy, Licen-

The immediate effect of the Deepwater Ports Act of 1974 is to extend federal jurisdiction to facilities beyond the territorial waters of the United States, thus filling the regulatory void which has deterred deepwater port development. This article considers the background, purposes, provisions, strengths, and weaknesses of the Act. Proponents strengths, and weaknesses of the Act. Proponents of the Act argue that deepwater ports will aid the importation of oil and provide an economically and environmentally sound way of transporting large amounts of oil over long distances. The environmental provisions of the Deepwater Ports Act are discussed in relation to the specific environmental threats posed by superports and su-pertankers. Regulatory schemes set forth in the pertankers. Regulatory schemes set forth in the Act include preconstruction testing of potential port sites, licensing of ports by the Secretary of Transportation, and some supervision by the Environmental Protection Agency. The article discusses a wide spectrum of issues such as oil spillage, cleanup side-effects, land-based development, oceanographic effects, and human health and tradestarts. and welfare. In conclusion the author states that the Deepwater Ports Act seems a reasonable legislative response to a complex problem. (Fernandez-Florida)

TOXIC WATERS (DISCUSSION OF RECENT FEDERAL ACTION AGAINST WATER POLLU-

Resources for the Future, Inc., Washington, D.C. In: Resources, No 48, p 14-15, January 1975. 2 p, 1

Descriptors: *Judicial decisions, *Water pollution, *Public health, *Lake Superior, *Mining, Pollutants, Waste water(Pollution), Waste water treattants, waste water (rountion), waste water treament, Wastes, Water, Water pollution effects, Great Lakes, Lakes, Federal government, Legal aspects, Water law, Water Quality Act, Federal Water Pollution Control Act, Mine wastes, Water pollution sources.

Identifiers: *Hazardous substances(Pollution), Federal Water Pollution Control Act Amendments of 1972, Nuisance(Legal aspects).

Of particular interest in this issue of Resources is a discussion of the water pollution problems in Lake Superior caused by the Reserve Mining Company. Discussion focuses on the dumping of 67,000 tons of taconite tailings into the lake. As citizen concern mounted over the murkiness of the water, the federal government sued Reserve for violation of the Federal Water Pollution Control Act and the Refuse Act. Later, a substantial amount of a submicroscopic fiber was detected. Evidence exists that these fibers in the water supply might be a cause of gastrointestinal cancer. In response, the suit was amended to include the public health issue and several states and environmental groups have joined in the suit. The article further discusses the history of the case through the courts. It is not yet concluded and Reserve Mining has been allowed to continue operations pending final decision in the Circuit Court. Central to the controversy is the question whether there is sufficient evidence to conclude that the fibers are cancer-causing. Another crucial consideration is the extent of economic harm that will be caused if immediate shutdown is ordered. (Fernandez-Florida)

SAVING OUR WATER RESOURCES, Office of Water Resources Research, Washington, For primary bibliographic entry see Field 6G. W75-12232

THE ECONOMICS OF CLEAN WATER. Environmental Protection Agency, Washington,

Available from Superintendent of Documents, GPO, Washington, D.C., as EP 2.14:973. December 1973, 120 p, 60 tab.

Descriptors: *Economic feasibility, *Economic prediction, *Cost-benefit analysis, *Pollution abatement, Water pollution, Water pollution control, Water pollution treatment, Infla-tion(Economic), Industrial wastes, Cost analysis, Cost-benefit theory, Government finance, Indus-

Cost-benein trial production. sources(Pollution), Hazardous substances

This is the 1973 edition of a report prepared an-nually by the Environmental Protection Agency (EPA). After a survey of the nature of water pollution and of recent advances in understanding the subject, this document analyzes in detail the curpollution level status of 22 major rivers, ranking them in groups from 'cleanest' to 'dirtiest'. The focus then shifts to the cost of water pollution control; EPA estimates the total cost of constructing municipal treatment and collection facilities eligible for federal funding under the 1972 Federal Water Pollution Control Act (FWPCA) Amendments to by \$60.1 billion. Of this sum about 35.9 billion is for treatment plants and new interceptor sewers. As for industrial plants (not including power plants), the highest estimate is that is will be necessary to invest an \$11.9 billion (1972 dollars) by 1977 to meet the pollution abatement standards set for that year. In 1972, industry invested only about one billion dollars in water pollution control about one offine documents in water political control facilities. Various approaches to the problem of non-point source pollution are then discussed. After an analysis of the types of benefits which are derived from water quality enhancement, the different fiscal and other constraints on the achievement of desired improvements are enumerated and discussed. The study concludes with various arguments suggesting the continued feasibility of meet-ing the higher standards of pollution control set forth by the FWPCA Amendments of 1972 and asks but does not answer a 'fundamental question': At what point do the additional costs of controlling all sources of pollutants exceed the ad-

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

ditional benefits of improved water quality. (Gerlach-Florida) W75-12233

TOWARD A CLEANER AQUATIC ENVIRON-

Environmental Protection Agency, Washington, D. C. Office of Air and Water Programs. K. M. Mackenthun.

Available from Superintendent of Documents, U. S. Govt Printing Office, Washington, D.C., as No 5501-00573, for \$2.05. 1973, 273 p, 62 plate, 20 fig, 2 tab, 1 append, 102 ref.

Descriptors: *Pollution abatement, *Environment, *Environmental control, *Aquatic life, Water qualify, Environmental effects, Industries, quanty, Environmental refects, industries, industrial wastes, Pollutants, Pollutant identification, Urbanization, Technology, Fish, Wastes, Oil, Slime, Rivers and Harbors Act, Water Quality Act, Water quality control, Lakes, Ponds,

Identifiers: Hazardous substances(Pollution), National Environmental Policy Act.

Positive action to ensure the attainment of protection from pollution and the enhancement of this country's environmental resources must be accelerated to compensate for continued pressures of population and industrial growth, urbanization, and technological changes. The key to success is dependent upon our ability to define and understand the quality and behavior of the aquatic environment. The author commences his study by examining the characteristics of the aquatic environment and environmental damage of recent years (e.g., dead fish, wastes, oil, slimes, etc.). Legal controls are then considered (e.g., the Rivers and Harbors Act of 1899, the National Environmental Policy Act of 1969, and the Water Quality Improvement Act of 1970). Consideration guanty improvement Act of 1790. Consideration is also given to investigation of aquatic problems, the reporting of results, biological nuisances, health-related aquatic problems and government abatement and control programs. Investigative techniques are also described in detail for the pond, stream and lake environments. Additionally, methods of correcting the causes of slime, plant, and animal nuisances are considered. (Gagliardi-W75-12234

LIABILITY FOR OIL POLLUTION DISASTERS: INTERNATIONAL LAW AND THE DELIMITA-TION OF COMPETENCES IN A FEDERAL

Syracuse Univ., N. Y. Coll. of Law.

Journal of Maritime Law and Commerce, Vol 6, No 3, p 303-329, (1975). 27 p, 121 ref.

Descriptors: *Oil spills, *Water pollution control, International law, Ships, Navigable waters, State governments, State jurisdiction, Supervisory control(Power), Federal government, Administration, Regulation, Jurisdiction, Coordination, Pollutant identification, Oil wastes, Nuclear wastes, Oily water, Legal aspects, Adoption and practices, In-ternational waters, Law of the sea, Treaties,

Foreign countries.
Identifiers: *Absolute liability, Intergovernmental aritime Consultative Organization(IMCO), Liability Convention(IMCO), Fund Convention(IMCO), Indemnification, Hazardous substances(Pollution), Oil Pollution Act, Territorial seas(Jurisdiction), FWPCA Amendments of 1972.

If the United States ratifies the Intergovernmental Maritime Consultative Organization's (IMCO's) Liability and Fund Conventions, the current rela between the federal government and the the area of liability for oil spills will be altered. IMCO's Conventions represent a move towards absolute liability for harms caused by extrahazardous activities, and towards the establishment of an international fund providing compensation to the victims of maritime oil pollution acents who are not otherwise protected by the Liability Convention. Adoption of these measures would make possible a uniform liability law, basis for damages, and process for recovery. The Oil
Pollution Compensation Bill would make the
provisions of the Liability and Fund Conventions part of the domestic law of the United States. If enacted, it would complement the Water Pollution Act Amendments of 1972 by defining and effec tuating the claims of individuals and local and state government. Conflicts with pre-existing liability and indemnification laws of the various states, such as the Florida Act, would have to be worked out. However, the creation of a uniform basis of recovery, on a national level, would eliminate many inconsistencies arising from the resolution of claims under various policies and jurisdiction of the several states. (Parrish-Florida)

LAND USE CONTROLS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT: A CITIZEN'S GUIDE,

National Resources Defense Council, Washing-

ton, D. C.
D. Donley, E. Moss, R. Outen, and G. Speth.
Environmental Law Reporter, Vol 5, p 5009250101, May 1975. 10 p, 57 ref.

Descriptors: *Federal Water Pollution Control Act, *Land use, *Land management, Legislation, Water quality, Comprehensive planning, Land classification, Land development, Zoning, Pollu-tants, Water quality control, Abatement, Mu-nicipal wastes, Inter-agency cooperation, Water nicipal wastes, Inter-agency cooperation, Mater Quality Act, Water pollution, Water pollution con-trol, Water pollution sources, Waste disposal, Waste treatment, Waste water(Pollution), Wastes. Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Non-degradation policy, Municipal sewage treatment, Effuent limitations, Hazardous substances(Pollution), Non-point sources(Pollution)

The Federal Water Pollution Control Act Amendments in 1972 recognized that if water quality is to be protected, effective regulation of existing sources of water pollution must be coupled with land use planning and regulation of the location of new sources. Six provisions of the 1972 Amendment sources. new sources. Six provisions of the 1972 Amendments are concerned with planning. Section 208, he most important, provides a basis for regulating non-point sources of pollution, such as general runoff from agricultural or mining operations. Section 208 also strengthens statutory control over point source pollution by requiring establishment of regulations governing the location, modification, and construction of all facilities which may discharge pollutants. Other aspects of section 208 and a critical analysis of the Environmental Protection Agency's implementation of the section are presented in detail. Further, the 1972 Amendments mandate a non-degradation policy to prevent water bodies, whose actual water quality is better than that required by law, from being 'legally' downgraded to the standards. In addition, the Amendments provide construction standards the Amendments provide construction standards for municipal sewage treatment plants. (Hoffman-W75-12237

1974 ANNUAL REPORT, GREAT LAKES BASIN COMMISSION.

Great Lakes Basin Commission, Ann Arbor, Mich.

June 30, 1974. 20 p, 8 photo, 1 map, 1 tab.

Descriptors: *Lake basins, *Shores, *Great Lakes, "Comprehensive planning, "Management, Lakes, Long-term planning, Regional develop-ment, Multi-purpose projects, Economics, Water policy, Basins, Watersheds(Basins), Great Lakes Region, Planning, Coordination, Research and Region, Planning, Coordination, Research and development, Water resources development, Fu-ture planning(Projected), Water manageture planning(Projected), ment(Applied).

Identifiers: *Coastal zone management. Lake basin development, State policy.

A summary of the Great Lakes Basin Commission's coordinating activities is presented. Major activities include coastal zone management, shore land damage reduction, survey of planning programs, international coordination and research, assessment of water and related land resources, public participation, and the Lake Erie Waste-water Management Demonstration Project. The Basin Commission is legally required to prepare a comprehensive plan for development of water and related land resources. This plan must include an inventory of basin resources, and an evaluation of the extent that those resources are being used. with projections for potential future use. The current status of this plan is presented, together with an analysis of other special studies carried on by the Commission. Further included, is a synopsis of the Great Lakes states' activities in water and re-lated land resources planning fiscal year 1974. Finally, the financial statement of the Great Lakes Basin Commission is reported. (Hoffman-Florida) W75-12238

SURVEYS ITS OREGON HAZARDOUS

WASTES, Oregon State Dept. of Environmental Quality,

Portland.
P. H. Wicks, and M. Synak.

Environmental Science and Technology, Vol 8, No 13, p 1080-1084, December 1974. 5 p, 3 photo, 1

Descriptors: *Oregon, *Waste disposal, *Water quality standards, *Surveys, Industrial wastes, Sewage disposal, Legislation, Water pollution, Municipal wastes, Data collections, Evaluation, Penalties(Legal), Industries, Electric power industry, Disposal, Waste water disposal, Environmental sanitation, Water pollution control, Water pollution source

Identifiers: Disposal sites, Enforcement programs, Administrative regulations, Effluent limitations, Hazardous substances(Pollution).

The need for improved hazardous waste disposal The need for improved hazardous waste disposal practices, adequate planning, and enforcement resulted in the enactment of a waste disposal law by the Oregon Legislature. The Oregon Department of Environment Quality was given regulatory responsibility for the law. Major provisions of the law require the licensing of disposal sites, state ownership of disposal site property, and the designation of pesticide and low-level radioactive wastes as hazardous substances. To fully implement the goals of the law, surveys were undertaken to gather and evaluate information concerning all facets of hazardous waste disposal. The types of industries surveyed were selected on the basis of materials, chemicals, processes, or other factors which might result in the production of hazardous waste. The data obtained from these surveys are presented. Industries surveyed included electric utilities, metal manufacturers, paper manufacturers, and oil terminals. Utilizing the survey results, projections about future wastethe survey results, projections about future waste-related problems are given. (Hoffman-Florida) W75-12239

THOSE ELUSIVE 1985 WATER QUALITY GOALS.

Professional Engineer, Vol 44, No 3, p 30-31, March 1975. 2 p, 3 photo.

Descriptors: *Research and development, *Comprehensive planning, *Federal Water Pollution Control Act, *Water demand, Water quality, Water management, Water supply, Water conservations of the conservation of the control of the cont vation, Water allocation(Policy), Pollutants, Municipal wastes, Economics, Dependable supply, Water quality control, Water policy, Technology, Identifiers: Research and development funding, Control technology.

WATER QUALITY MANAGEMENT AND PROTECTION-Field 5

Water Quality Control—Group 5G

A report of the U.S. General Accounting Office indicates that it is doubtful that the Federal government will meet the 1985 goal set by Congress to eliminate the discharge of pollutants into the na-tion's rivers. Current funding levels for water polthion research and development are the central factors behind this grim forecast. The report indicates that increased funding is necessary to make improvements in several vital areas. Research is needed to determine how pollutants get into the water, what happens to them, and their effect. Technology is needed to control pollution from industrial and non-point sources and to minimize the cost of treating municipal sewerage From an administrative viewpoint, there is need for a national plan to improve coordination of water pollution research and development. Up to the present, much of the nation's water pollution efforts have been fragmented and diverse. A federal focal point is needed to coordinate the dissemination of research information so that research and development programs can be made more responsive to Environmental Protection Agency operating programs, and the duplication of research efforts can be eliminated. (Hoffman-Florida) W75-12242

TOUGH SOLID-WASTE LAWS BREWING ON CAPITOL HILL.

Chemical Engineering, Vol 82, No 2, p 56, 58, January 20, 1975. 2 p, 1 tab.

Descriptors: *Solid wastes, *Ultimate disposal, *Incineration, *Landfills, Legislation, Chemical wastes, Standards, Administration, Waste disposal, Waste dumps, Regulation, Permits, Recycling.

Identifiers: Packaging waste, Hazardous wastes, Chemical treatment, Solid-waste treatment Chemical techniques.

More stringent national legislation concerning solid waste handling is apparently in the offing. The proposed legislation focuses in two main directions: cutting down on packaging wastes, and keeping careful watch over hazardous wastes. All ittees in the Senate are in agreement that techniques are needed to cope with the growing volume of packaging activity. There is a difference ion, however, as to the role the Environmental Protection Agency (EPA) should play. The Commerce Committee's version requires the EPA to set enforceable standards for the manufacture of packaging materials, while the Public Works Committee only calls on the EPA to issue advisory guidelines. The legislation concerning the hazardous wastes involves the establishment of a regulatory framework that approximates current air and water legislation. The EPA would set stanrds and issue permits for disposal. Currently, the EPA is studying three basic technical options for hazardous waste management - incineration, chemical treatment, and special landfill. The guidelines developed by these three studies will serve to set the standards and regulations if the proposed legislation is passed. (Hoffman-Florida) W75-12243

A NEPA SETTLEMENT: CONSERVATION COUNCIL OF NORTH CAROLINA V. FROEHLKE, Northwestern Univ., Evanston, Ill. School of

For primary bibliographic entry see Field 6E. W75-12244

THE WATER POLLUTION PERMITTING SYSTEM, Union Bank and Trust Co., Montgomery, Ala.

H. A. Leslie. Alabama Lawyer, Vol 35, No 2, p 192-201 (1974). 10 p.

Descriptors: *Alabama, *Permits, *State governments, *Water pollution control, Water pollution treatment, Water quality control, Governmental interrelations, Federal government, Federal Water Pollution Control Act, State jurisdiction, Water quality standards, Regulation, Law enforcement.

The Alabama Water Improvment Commission has adopted water quality standards and regulations. Enforcement mechanisms include permits which must be obtained by persons discharging pollu-tants, in order to avoid civil and criminal Penalties. Plans are submitted describing the facility, which may lead to a Commission study. Following public hearings, a permit is issued which specifies effluent limitations. Further controls include Attorney General prosecution following failure to appeal a Commission order. Appeal via public hearings before the Commission allows immediate enforcement by the Attorney General if the order is reaffirmed at the hearing. State permits are issized following construction, using Federal Environmental Protection Agency guidelines, and run for an indefinite period. The Commission also certifies federal permits to ensure that local sources meet the performance standards of the Environmental Protection Agency. (Knocke-Florida) W75-12245

ENFORCING INTERNATIONAL LAW: U.S. AGENCIES AND THE REGULATION OF OIL POLLUTION IN AMERICAN WATERS, Maryland Univ., College Park. Dept. of Political

Journal of Maritime Law and Commerce, Vol 6, No 2, p 273-285 (1975). 13 p, 33 ref.

Descriptors: *Federal Water Pollution Control Act, *Coast Guard regulations, *Oil spills, *Federal jurisdiction, International law, Interna-tional waters, Oil pollution, Law of the sea, Administrative agencies, Administrative decisions. Identifiers: *Enforcement(International).

The 1970 Federal Water Pollution Control Act (FWPCA) prohibits discharge of oil within the twelve mile contiguous zone. Any 'visible sheen' of oil on the water subjects oil spillers to civil and criminal penalties, but the act stresses cleanup and prevention. Presidential authority and Coast Guard decisions to prosecute indicate that the United States has an option to expand and enforce international standards through simple spill definitions. The author examines the conflict between a preventive or clean-up program versus the con-sequences of stiff enforcement, which is inherently limited beyond waters immediately adjacent to the United States coastline. (Knocke-Florida) W75-12246

ADMIRALTY'S POWER IN RE OIL POLLU-TION (STATES ABLE TO SET MORE STRIN-GENT PENALTIES),

J. H. Scherr. latural Resources Lawyer, Vol 7, No 4, p 635-653 (1974), 19 p. 133 ref.

Descriptors: *Florida, *Oil spills, *Water Quality Act, *State jurisdiction, Federal jurisdiction, Federal-state water rights conflicts, Governmental interrelations, Reservation doctrine, Constitutional law, Pollution taxes(Charges). Identifiers: *Strict liability

Florida's Oil Spill Prevention and Pollution Control Act is not an unconstitutional intrusion into the federal maritime domain, nor is it preempted by the Federal Water Quality Improvement Act, although Florida's strict liability for spills from any vessel imposes standards more stringent than federal legislation. Special definition of the additional or supplemental police power and the twilight zone between state and federal powers have allowed escape from strict uniformity requirements. However, existing case law provides only a first step towards full recognition of state power to enact a law more stringent than the Federal Water Quality Improvement Act. (Knocke-Florida) W75-12248

RECOGNITION OF SUBSTANTIVE RIGHTS

UNDER NEPA, California State Water Resources Control Board,

For primary bibliographic entry see Field 6E. W75-12250

A SOLUTION TO THE PROBLEM OF PRIVATE COMPENSATION IN OIL DISCHARGE SITUA-TIONS.

University of Miami Law Review, Vol 28, No 3, p 524-550 (1974). 25 p, 138 ref.

Descriptors: *Penalties(Legal), *Oil pollution, *Oil spills, *Navigable waters, *Legal aspects, Law of the sea, Judicial decisions, Negligence, Trespass, Water pollution, Water pollution sources, Oily water, Oil, Oil wastes, Disasters, Waste water(Pollution), Oil industry, Riparian rights, Water law, Common law, International law, Water rights, Legislation, Non-structural alternatives, Federal Water Pollution Control Act. Identifiers. *I inhibity(Legal aspects), Environ-Identifiers: *Liability(Legal aspects), Environ-mental policy, Federal Water Pollution Control Act Amendments of 1972, International torts, International agreements, Non-print sources(Pollution), Nuisance(Legal aspects), Ter-

Discharges of oil from vessels on the navigable waters of the United States and the resultant injury to the environment and population is the tonic of this article. This paper examines the question of whether those who are damaged by such discharges can adequately obtain compensation for their injuries. First the author discusses the choice of a forum for relief, that is, whether a plaintiff should institute his suit in a federal or state court. Traditional concepts of tort liability, such as trespass, negligence, and nuisance, are considered with regard to their adequacy as a basis for compensation. It is suggested that an examination of the common law concepts of tort liability from the claimant's standpoint reveals numerous inadequacies in the relief available for damage suffered as a result of a vessel's discharge of oil on navigable waters. Compensation based on maritime concepts of liability is considered. The article points out that there is no present provision for relief under any International Conventions nor under the Federal Water Pollution Control Act. Related state statues are discussed. In conclusion, the author suggests, that in order to enhance the availability of effective compensation for victims of a vessel's discharge of oil on the navigable waters of the United States, the federal government should establish a fund to provide compensation (65). tion. (Fernandez-Florida) W75-12254

DIKED DISPOSAL AREA SITE NO 12. CLEVE-LAND HARBOR, CUYAHOGA COUNTY, OHIO.
Army Engineer District, Buffalo, N. Y.
For primary bibliographic entry see Field 5E. W75-12255

WATER QUALITY MANAGEMENT BASIN PLANS--POLICIES AND PROCEDURES. Environmental Protection Agency, Washington,

Federal Register, Vol 39, No 107, Part II, p 19631-19644, June 3, 1974. 14 p.

Descriptors: *Administrative agencies, *Regulation, *Water quality control, *Research

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

and development, *River basin development, Water basins, Federal government, Federal Water Pollution Control Act, Permits, Comprehensive planning, Future planning(Projected), Long-term planning, Project planning, Non-structural alterna-tives, Management, Water management(Applied), Water resources development, State governments, Governmental interrelations, Water conservation. Identifiers: *Administrative regulations, *Federal Water Pollution Control Act Amendments of 1972. Environmental Protection Agency, Environmental policy, Hazardous substances(Pollution), Non-point sources(Pollution) National Pollution point sources(Pollution), National Pollutant Discharge Elimination System, State policy.

The purpose of this Environmental Protection notice is to amend 40 CFR to add a new Part 130-Policies and Procedures for State Continuing Planning Process. Section 303(e) of the Federal Water Pollution Control Act requires each state to submit a continuing planning process which is consistent with the Act. These final regulations, which describe the necessary elements of a state's continuing planning process, provide policies and procedures for review, revision, and approval. In addition the regulations provide a mechanism for states to satisfy their responsibil-ties with respect to critical waters and total max-imum daily loads, reports on water quality and related information, clean lakes, estimates of con-struction needs for publicly-owned treatment works, and federal reports on water quality. Further, 40 CFR is amended to add a new Part 131-Preparation of Water Quality Management Basin Plans. The regulations describe the requirements governing basin plans and the procedures governing basin plan adoption, submission, revi-sion, and approval. (Fernandez-Florida) W75-12260

IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS,

Environmental Protection Agency, Washington,

Federal Register, Vol 39, No 126, Part II, p 24114-24147, June 28, 1974. 34 p.

Descriptors: "Administrative agencies, "Regulation, "Effluents, "Iron, "Steel, Metals, Iron alloys, Alloys, Wastes, Water pollution sources, Federal government, Sewage effluents, Air pollution, Discharge(Water), Industrial wastes, Liquid wastes, Sanitary engineering, Waste water(Pollution), Waste water disposal, Water pollution.
Identifiers: *Administrative regulations, *Effluent

limitations, *Pretreatment standards(Effluent), Environmental policy, Federal Water Pollution Control Act Amendments of 1972, National Pollutant Discharge Elimination System, Environmental Protection Agency.

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the iron and steel manufacturing category of point sources, by amending 40 CFR, Chapter 1, Subchapter N, to add a new Part 420. Guidelines are established for the following subcategories: by-product coke, beehive coke, sintering, blast-furnace (iron), blastfurnace (ferromanganese), basic oxygen furnace (semiwet air pollution control methods), basic oxygen furnace (wet air pollution control methods), open hearth furnace, electric arc furnace (semiwet air pollution control methods), electric arc furnace degassing, and continuous casting. The Environ-mental Protection Agency simultaneously proposes a separate provision stating the applica-tion of the limitations and standards set forth below to users of publicly owned treatment works. Notice is also given of proposed regulations setting forth the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-

MI

W75-12264

CANNED AND PRESERVED SEAFOOD PROCESSING POINT SOURCE CATEGORY—EFFLUENT LIMITATIONS GUIDELINES. Environmental Protection Agency, Washington,

Federal Register, Vol 39, No 124, Part II, p 23134-23156, June 26, 1974, 23 p.

Descriptors: *Food processing industry, *Foods, *Administrative agencies, *Regulation, *Effluents, Crabs, Wastes, Water pollution sources, Federal government, Sewage effluents, Air pollution, Discharge(Water), Shellfish, Industrial wastes, Liquid wastes, Sanitary engineering, Waste water(Pollution), Waste water disposal, Shrimp, Water pollution, Industries, Pollutants, Canneries, Fish.

Canneries, Fish.
Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards(Effluent), Environmental policy, Federal Water Pollution Control Act Amendments of 1972, National Pollutions (Control Act Amendments of 1972, National Pollutions) tant Discharge Elimination System, Environmen-

tal Protection Agency.

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the Canned and Preserved Seafood Processing category of point sources by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 408. Subcategories of processing regulated include: farm-raised catfish, conventional blue crab, mechanized blue crab, Alaskan crab, dungeness and tanner crab, Alaskan shrimp, northern shrimp, southern shrimp, and tuna. The Environmental Protection Agency simultaneously proposes a separate sec-tion stating the application of the limitations and standards to users of publicly owned treatment works which are subject to pretreatment standards under the Federal Water Pollution Control Act. Notice is also given of proposed regulations con-cerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-Florida) W75-12265

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY-EFFLUENTS
GUIDELINES AND STANDARDS AND
PROPOSED LIMITATIONS.
Environmental No. Environmental Protection Agency, Washington.

Federal Register, Vol 39, No 68, Part III, p 12832-12844, April 8, 1974. 13 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Fertilizers, Ammonium compounds, Nitrates, Nitrogen compounds, Phosphates, Treatment, Waste water disposal, Water pollution treatment, Treatment facilities, Administration, Federal government, Wastes, Sewage effluents, Water pollution sources, Discharge(Water), Industrial wastes, Waste Discharge(Water), Industrial wastes, water(Pollution), Water pollution, Ureas. Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards(Effluent), Federal Water Pollution Control Act Amendments of 1972. Hazardous substances(Pollution).

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the fertilizer manufacturing category of point sources, by amending 40 CFR Chapter 1, Subchapter N, to add a new part 418. Subcategories regulated include: phosphate, ammonia, urea, ammonium nitrate, nitric acid. Limitations guidelines established representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available and economically achievable. Additionally, the Environmental Protection Agency simultaneously proposes a separate provision stating the application of the limitations and standards to users of publicly-owned treatment works which are su to pretreatment standards under the Federal Water Pollution Control Act. Notice is given of proposed regulations concerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-Florida) W75-12266

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS. Environmental Protection Agency, Washington,

Federal Register, Vol 39, No 76, Part II, p 13942-13954, April 18, 1974, 13 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Lumber, *Standards, Industrial wastes, Bark, Hardwood, Federal Water Pollution Control Act, Waste Water Pollution Control Act, Waste water (Pollution), Water pollution, Chemical wastes, Water Quality Act, Treatment, Administration, Federal government, Trees, Permits, Legal aspects, Legislation, Water policy, Wastes, Water pollution sources, Sewage, Effluents, Discharge(Water).

Identifiers: *Administrative regulations, *Effluent limitations, *FWPCA Amendments of 1972, *Pretreatment standards(Effluent), Environmental policy, Hazardous substances (Pollution), National Pollutant Discharge Elimination System.

The purpose of this notice is to establish final ef-fluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the timber products processing category of point sources, by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 429. This final rulemaking is promulgated pur-suant to the Federal Water Pollution Control Act. Guidelines are established for the following sub-Guidelines are established for the following sub-categories: barking, veneer, plywood, hardboard-dry process, hardboard-wet process, wood preserving, wood preserving-steam, and wood-preserving-boultonizing. Additionally, the En-vironmental Protection Agency simultaneously proposes a separate provision stating the applica-tion of the limitations and standards to users of publicly owned treatment works. Notice is given of proposed regulations concerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompati-ble pollutants. (Fernandez-Florida) W75-12267

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS AND PROPOSED APPLICATION TO PRETREAT-

Environmental Protection Agency, Washington,

Federal Register, Vol 39, No 81, Part II, p 14676-14685, April 25, 1974. 10 p.

Descriptors: *Regulation, *Administrative agencies, Effluents, *Organic wastes, *Effluents, wastes. emical wastes, Chemicals, Standards, Indusrial wastes, Organic compounds, Federal Water Pollution Control Act, Waste water(Pollution), Water pollution, Water Quality Act, Treatment, Administration, Federal government, Permits, Legal aspects, Legislation, Water pollution

Identifiers: *Administrative regulations, *Effluent limitations, *FWPCA Amendments of 1972, *Pretreatment standards(Effluent), Environmental policy, Hazardous substances(Pollution), Na-tional Pollutant Discharge Elimination System.

The purpose of this notice is to establish final ef-fluent limitations guidelines for existing sources

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and standards of performance and pretreatment standards for new sources in the organic chemicals standards for new sources in the organic chemicals manufacturing category of point sources, by amending 40 CFR Chapter I, Subchapter N, to add a new Part 416. This final rulemaking is promultated production of the control of the co nonaqueous processes, processes with water contact as steam diluent or absorbent, and aqueous liquid phase reaction systems. Additionally, the Environmental Protection Agency simultaneously proposes a separate provision stating the application of the limitations and standards set forth below to users of publicly-owned treatment works which are subject to pretreatment standards. Notice is also given of proposed regulations con-cerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-W75-12268

SOAP AND DETERGENT MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT LIMITATIONS GUIDELINES.

Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 39, No 72, Part II, p 13370-13397, April 12, 1974. 28 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Detergents, *Soaps, Sulfonates, Federal Water Pollution Control Act, Waste water(Pollution), Water pollution, Chemical wastes, Chemicals, Water Quality Act, Treatment, Administration, Federal government, Perment, Administration, Federal government, Permits, Legal aspects, Legislation, Water policy, Wastes, Water pollution sources, Sewage effluents, Discharge(Water), Industrial wastes. Identifiers: *Administrative regulations, *Effluent limitations, *Federal Water Pollution Control Act Amendments of 1972. *Pretreatment standards(Effluent), Environmental policy, Hazardous substances(Pollution), National Pollutant Discharge Flimination System tant Discharge Elimination System

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the soap and deterstandards for new sources in the soap and deter-gent manufacturing category of point sources, by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 417. This final rulemaking is promul-gated pursuant to the Federal Water Pollution Control Act, as amended Subcategories regulated include: soap manufacturing by batch kettle, fatty acid manufacturing by fat splitting, soap manufac-turing by fatty acid neutralization, glycerine conturing by fatty acid neutralization, glycerine con-centration, glycerine distillation, manufacture of soap flakes and powders, manufacture of bar soaps, manufacture of liquid soaps, oleum sul-fonation and sulfation, air-SO3 sulfation and sul-fonation, SO3 solvent and vacuum sulfonation, sulfamic acid sulfation, chlorosulfonic acid sulfation, neutralization of sulfuric acid esters and sulfonic acids, and the manufacture of various detergents. Additionally, the Environmental Protection gents: Administration, the Environmental Protection Agency simultaneously proposes a separate provi-sion stating the application of the limitations and standards to users of publicly owned treatment works. (Fernandez-Florida) W75-12269

TIMBER PRODUCTS-PROPOSED EFFLUENT GUIDELINES AND PERFORMANCES AND PRETREATMENT STANDARDS FOR NEW

Environmental Protection Agency, Washington,

Federal Register, Vol 39, No 2, Part III, p 938-949, January 3, 1974, 12 p.

Descriptors: *Wood wastes, *Federal Water Pol-lution Control Act, *Lumber, *Water quality stan-dards, Water pollution control, Industrial plants, Waste disposal, Industrial wastes, Water pollution

sources, Pulp wastes, Lumbering, Pulp and paper industry, Construction materials.

Identifiers: *Plywood, *Veneer, Timber products

processing.

Subcategories under the timber products processing category of the Federal Water Polluproducts tion Control Act are regulated as eight subcategories, according to their effluent characteristics, and classed as new point sources under this proposed regulation. Subcategories of barking, veneer, plywood, hardboard-dry process, hardboard-wet process, wood preserving, preserving-steam, and wood preserving boultonizing are each considered according to waste categorization, treatment and control technology, maximum effluent limitations, non-water quality aspects of pollution control, economic impact analysis. A summary of public participation and comment is provided. (Hoffman-Florida)

BEET SUGAR PROCESSING POINT SOURCE SUBCATEGORY--EFFLUENT GUIDELINES AND STANDARDS.

Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 39, No 22, Part II, p 4034-4040, January 31, 1974. 7 p.

Descriptors: *Sugar beets, *State governments, *Odor, State jurisdiction, Condensation, Fog. Water pollution, Discharge(Water), Sugar crops, Air pollution effects, Agriculture, Energy conversion, Energy dissipation. Identifiers: *Beet sugar.

The beet sugar subcategory within the point source category of sugar processing, under the Federal Water Pollution Control Act, establishes final effluent limitation guidelines on performance and pretreatment standards for new sources in the subcategory. The Environmental Protection Agen-cy also applies these standards to users of publically-owned treatment works, but only those subject to pretreatment standards under the Act. Final regulations differ from those proposed, in regulation of plants by 1983 effluent guidelines and monolithic subcategorization of the industry. Energy requirements, fogging from condenser water, odor from increased land disposal, definition of effluent load and effect on state water rights are also specifically covered by the final regulation. (Hoffman-Florida) W75-12271

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS AND GUIDELINES.

Environmental Protection Agency, Washington

Federal Register, Vol 39, No 195, Part II, p 36094-36099, October 7, 1974. 6 p.

Descriptors: *Fertilizers, *Water pollution sources, *Federal Water Pollution Control Act, *Ammonium compounds, Chemicals, Agricultural chemicals, Water pollution, Energy, Fertilization, Administrative agencies, Data collections, Data temporaries of Western (Western) transmission, Pretreatment(Water).
Identifiers: *Mixed and blend fertilizers.

Proposed effluent limitations and guidelines for new sources within the fertilizers category add subcategories of ammonium sulfate and mixed and blend, under the Federal Water Pollution Control Act and its administration by the Environmental Protection Agency. Point source effluents are to meet the best practicable and best available standards by 1977 and 1983 respectively, and new categories data and standards are to be periodically developed acts. cally developed according to the unique require-ments and technologies of pretreatment standards. Ammonium sulfate produces waste in water as ammonium, while mixed and blend fertilizers produce no direct liquid waste. Specific treatment

and control technology, costs, energy require-ments, and public and administrative reaction to the proposals are considered. (Hoffman-Florida) W75-12272

MEAT PRODUCTS POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STAN-

Environmental Protection Agency, Washington, DC

Federal Register, Vol 39, No 41, Part II, p 7894-7908, February 28, 1974. 15 p.

Descriptors: *Effluents, *Industrial wastes, *Water quality standards, *Regulation, *Waste treatment, Wastes, Water pollution sources, Discharge(Water), Water pollution standards, Control, Performance, Administrative agencies, Federal government, Treatment, Waste water

Federal government, Ireatment, Waste water treatment, Cleaning, Environmental effects. Identifiers: *Administrative regulations, *Effluent limitations, *Federal Water Pollution Control Act Amendments of 1972, *Pertreatment standards(Effluent), *Environmental Protection Agendards(Effluent), *Environmental Effection cy, Environmental policy, Hazardous sub-stances(Pollution).

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the meat products standards for new sources in the meat products category of point sources, by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 432. Guidelines are promulgated for new sources within the simple slaughterhouse, complex slaughterhouse, low-orocessing packinghouse, and high-processing packinghouse subcategories. Further delineated are effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available. practicable control technology currently available, as well as the best available technology economically achievable. In addition, the Environmental Protection Agency proposes a separate provision which states the application of the limitations and standards to users of publicly owned treatment works which are subject to pretreatment standards under Federal Water Pollution Control Act. Notice is also given, pursuant to the Act, of proposed regulations concerning the application of effluent limitations guidelines for incompatible pollutants. (Fernandez-Florida) W75-12273

GRAIN MILLS POINT SOURCE CATEGORY-EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS.

Environmental Protection Agency, Washington,

Federal Register, Vol 39, No 55, Part II, p 10512-10520, March 20, 1974. 9 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Mills, *Grains(Crops), Wheat, Rice, Corn(Field), Standards, Water pollution, Treatment, Water treatment, Waste treatment, Federal government, Wastes, Water pollution sources, Sewage effluents, Discharge(Water), Industrial wastes, Waste water (Pollution), Waste water discarding the property of the pro

Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards(Effluent), Federal Water Pollution Control Act Amendments of 1972, Hazardous substances(Pollution), Environmental Protection Agency.

The purpose of this notice is to establish final ef-fluent limitations guidelines for existing sources and standards of performance and pretreatment and standards of performance and pretreatment standards for new sources in the grain mills category of point sources by amending 40 CFR Chapter 1, Subchapter N, to add a new Part 406. Subcategories regulated include: corn wet milling, corn dry milling, normal wheat flour milling, bul-gur wheat flour milling, normal rice milling, and parboiled rice processing. These regulations

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govern the discharge of pollutants into navigable waters. Additionally, the Environmental Protec-tion Agency hereby gives notice of proposed regu-lations concerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. Further, rules are proposed to regulate users of publicly owned treatment works which are subject to pretreatment standards. (Fernandez-Florida) W75-12274

PLASTICS AND SYNTHETIC POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND

Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 39, No 67, Part 11, p 12502-12525, April 5, 1974. 24 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Plastics, *Treatment, Water pollution treatment, Water treatment, Resins, Standards, Treatment facilities, Adminis tration, Federal government, Wastes, Sewage ef-fluents Water pollution sources, Discharge(Water), Industrial wastes, Waste water(Pollution), Water pollution, Waste water

Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards(Effluent), Federal Water Pollution Control Act Amendments of 1972, Hazardous substances(Pollution).

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the plastics and synthetics category of point sources by amending 40 CFR Chapter 1, Subchapter N, to add a new part 416 Subchapters segulated include polyuit Part 416. Subcategories regulated include: polyvinyl chloride, polyvinyl acetate, polystyrene, polypropylene, polyethylene, cellophane, rayon, acrylonitrile-butadienestyrene (ABS) and styreneacrylonitrille (SAN) resin copolymers, polyster, nylon 66, nylon 6, cellulose acetate and acrylics. Additionally, the Environmental Protection Agency simultaneously proposes rules stating the appli-cation of the limitations and standards to users of canon of the immiations and standards to users or publicly owned treatment works subject to pretreatment standards under the Federal Water Pollution Control Act. Further, notice is hereby given of proposed rules concerning the application of effluent limitations guidelines for existing sources to pretreatment standards for incompati-ble pollutants. (Fernandez-Florida) W75-12275

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS AND PROPOSED LIMITATIONS.

Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 39, No 68, Part II, p 12822-12830, April 8, 1974. 9 p.

Descriptors: *Administrative agencies, *Regulation, *Effluents, *Standards, *Metals, Aluminum, Treatment, Waste water disposal, Water pollution treatment, Water treatment, Treatment facilities, Administration, Federal government, Wastes, Sewage effluents, Water pollution sources, Discharge(Water), Industrial wastes, Waste water(Pollution), Water pollution (Jentifiers: *Administrative regulations *Fffluent Identifiers: *Administrative regulations, *Effluent limitations, *Pretreatment standards(Effluent), Federal Water Pollution Control Act Amendments of 1972, Hazardous substances(Pollution).

The purpose of this notice is to establish final effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources in the nonferrous metals manufacturing category of point sources by amending 40 CFR Chapter 1, Subchapter N, to add

a new Part 421. Guidelines are established for the following subcategories: bauxite refining, primary aluminum smelting, and secondary aluminum smelting. Limitations are established representing the degree of effluent reduction attainable by the application of the best practical control technology currently available and economically achievable. In addition, the Environmental Protection Agency simultaneously proposes rules regarding the application of the limitations and standards to users of publicly owned treatment works which are subject to pretreatment standards under the Federal Water Pollution Control Act. Notice is given regarding the application of effluent limitations guidelines for existing sources to pretreatment standards for incompatible pollutants. (Fernandez-Florida) W75-12276

INTRODUCTION OF S433 (BILL FOR SAFE DRINKING WATER).
For primary bibliographic entry see Field 6E.

W75-12280

UNITED STATES V. DEXTER CORP. (APPEAL BY SANITARY DISTRICT FROM CONVICTION FOR DISCHARGE OF MANUFACTURING REFUSE INTO NAVIGABLE WATERS). For primary bibliographic entry see Field 6E.

TRAIN V. CITY OF NEW YORK (CLASS AC-TION BY CITY TO COMPEL EPA TO ALLOT FUNDS AUTHORIZED BY THE 1972 FEDERAL WATER POLLUTION CONTROL ACT AMEND-

For primary bibliographic entry see Field 6E. W75-12284

TRAIN V. CAMPAIGN CLEAN WATER, INC. (ACTION BY ENVIRONMENTAL GROUP TO REQUIRE EPA TO RELEASE FUNDS AUTHORIZED FOR FEDERAL GRANTS TO MUNICIPALITIES FOR WATER POLLUTION

For primary bibliographic entry see Field 6E. W75-12285

WETZEL V. A. DUDA AND SONS (ACTION BY RIPARIAN PROPERTY OWNERS TO ENJOIN WATER POLLUTION TO LAKE FROM FARM-ING OPERATIONS). For primary bibliographic entry see Field 6E. W75-12286

COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. V. TRAIN (CITIZEN SUIT TO COMPEL THE ENVIRONMENTAL PROTECTION AGENCY TO CONTROL DISCHARGE OR RADIOACTIVE MATERIALS INTO NAVIGABLE WATERS). For primary bibliographic entry see Field 6E. W75-12287

GULF SHORE SEAFOOD AND COMPANY V. CITIES SERVICE CO. (ACTION FOR DAMAGES ARISING FROM DAM BREAK OF PHOSPHATE COMPANY'S DAM PERMITTING PHOSPHATE SLIME POLLUTION OF RIVER). For primary bibliographic entry see Field 6E. W75-12291

VALIDITY, UNDER FEDERAL CONSTITU-TION, OF STATE STATUTE OR LOCAL OR-DINANCE REGULATING PHOSPHATE CON-TENT OF DETERGENTS,

For primary bibliographic entry see Field 6E. W75-12293

PROCESS FOR RAW WATER CLARIFICA-PROCESS TO THE PROCESS FOR T

For primary bibliographic entry see Field 6E. W75-12294

WATER CONSERVATION IN SWEDEN: II. POLLUTION CONTROL, National Swedish Environment Protection Board.

UNITED STATES V. ASHLAND OIL AND TRANSPORTATION CO. (APPEAL FROM FINDING THAT DEFENDANT HAD VIOLATED

FWPCA AMENDMENTS OF 1972 BY DISCHARGING OIL INTO NAVIGABLE

Stockholm.

A. Liedberg, and I. Olsson.

Journal Water Pollution Control Federation, Vol
47, No 4, p 669-672, April, 1975.

Descriptors: *Legislation, *Waste water treat-*Pollution abatement, Urbanization, Population, Detergents, Eutrophication, Bodies of water, Environmental effects, Treatment facili-ties, Municipal wastes, Sludge treatment, Sludge disposal.

Identifiers: *Sweden, Environmental Protection

During the last century there has been a definite redistribution of population in Sweden from almost 90% rural to over 80% urban. At the same the population has doubled. Heavy pollution in lakes, rivers, and coastal waters occurred as a result of the urbanization, population growth, and municipal waste regulations. Eutrophication was increased by the use of synthetic detergents. In the 1960's the Swedish government instituted action 1960's the Swedish government instituted action programs and policy goals to prevent further deterioration of the environment. The Environmental Protection Act became effective in 1969 to regulate the use of land and supervision of activities hazardous to the environment. Prior to the enactment of the Environmental Protection Act only 50% of the urban households were connected to biolectical treatment relater. 256%, to circumstances. only 30% of the troan nouseholds were connected to biological treatment plants, 25% to primary treatment plants, and 25% no treatment plants. Presently 50.6% are connected to chemical and biological/chemical treatment, 40.6% biological biological/chemical treatment, 40.0% biological treatment, 7.8% sedimentation and 1% no treatment. Technological progress and government grants as well as legislation and political goals resulted in this rapid progress. Guidelines for the treatment and disposal of sludge are in preparation Positive of these progress. tion. Positive effects of these programs have been the restoration of heavily polluted areas, a decrease in algal growth, and a recolonization by fish. (Dean-FIRL) W75-12317

ARE CHEMICALS USED ALGAE CONTROL BIODEGRADABLE.

Wisconsin Univ., Madison. For primary bibliographic entry see Field 5C. W75-12325

HOW TO EVALUATE WATER MAIN CAPACI-TIES, PART I, For primary bibliographic entry see Field 8B. W75-12329

ENVIRONMENTAL WATER QUALITY PRO-

GRAM, Chicago Dept. of Aviation, III. M. F. Obrecht, W. E. Downes, and R. W. Valiquet. Heating, Piping, Air Conditioning, Vol 47, No 6, p 47-53, June, 1975. 10 ref.

Descriptors: *Airports, *Water pollution control, *Water quality, Administration, Oil spills, Indus-

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Water Quality Control—Group 5G

trial wastes, Sewage, Fuels, Illinois, *Monitoring, *Pollutant identification. Identifiers: Chicago(III).

The history of the O'Hare Water Quality Section of the Department of Aviation, City of Chicago, Il-linois, is discussed from its beginning in October 1971 to the present. The ultimate objective of the program is to allow the airport to maintain strict compliance with existing and future regulations through continuous monitoring and testing. The O'Hare International Airport has the typical operations of most major airports including: air-craft fueling and maintenance; vehicle servicing; aircraft lavatory servicing; continuous construc-tion and remodeling; land fill; and, grading. A Master Quality Control Program has been developed. An emergency oil spill plan is part of this master program. Communication equipment, portable booms, sorbent material, pump-out and skimming equipment, shovels, sledgehammers, stakes, lines, boots, lifejackets, available holding tanks, and earth moving equipment are some of the equipment necessary for an efficient oil containment and removal program. The Technical Committee for Present and Future Water Control Projects was formed to be representative of all the nts of the airport. The committee will discuss violations and common problems, pass resolu-tions, and field test proposed solutions. The establishment of a Master Water Quality Control Program is believed to be necessary for the comce with present and future water quality stanpleane with present and ruture water quainty standards at any airport. The program instituted at O'Hare may also be applied to tank farms, railroad terminals, and industrial complexes. (Orr-FIRL) W75-1231

NORTH WEST: A DIRTY INHERITANCE. Water, No 3, p 19-22, April, 1975. 3 fig.

Descriptors: *Water sources, *Water pollution, Water supply, Administration, Planning, Recreation facilities, Investment, Rivers, Estuaries, Fisheries.

Identifiers: England, River management, Coastal

The North West Water Authority covers the area of the northwest England including Liverpool, Manchester, and the Lake District with a population of approximately seven million. For many years the water supply for both Manchester and Liverpool has come from the Lake District and north Wales. As a result little concern was shown about the discharge of effluents into the rivers causing pollution. Some of the tasks facing the North West Water Authority are improving water instruction in rural areas, sewerage in the rural areas, and the pollution in the Mersey Belt and other parts of the region. Future industrial and residential development of the area is an important factor in the North West Water Authority's capital planning along with cooperation with the local authorities. The future organization of the Authority will include seven divisions, five of which will be in the heavily populated southern half of the area. There will be a single division for river management. Water recreation needs are er of the Authority's concerns. The Lake District is a well known recreational area as well as the coastal resorts. Some of the coastal waters are not suitable for boating or other water sports. The authority hopes to expand recreation on the waters under its jurisdiction nearer population centers. The development of fisheries and recreational facilities as well as the clean up of coastal waters, rivers and estuaries will require major invest-ments. (Dean=FIRL) W75-12336

HISTORICAL AND LEGAL ASPECTS OF For primary bibliographic entry see Field 6G. W75-12337

HOW WELL ARE WE HANDLING TOXIC WASTE.

For primary bibliographic entry see Field 5E.

AERATION UPGRADES RESERVOIR. Escondido Mutual Water Co., Calif. For primary bibliographic entry see Field 5F. W75-12346

PROCEEDINGS OF THE ANNUAL CON-FERENCE OF THE BRITISH COLUMBIA WATER AND WASTE ASSOCIATION. For primary bibliographic entry see Field 5F. W75-12350

WATER QUALITY MANAGEMENT IN A METROPOLITAN AREA, British Columbia Univ., Vancouver. Westwater

Research Centre.

A. H. J. Dorcey, and K. J. Hall.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 195-217. 4 fig, 11 tab, 8 ref.

Descriptors: *Municipal wastes, *Water pollution sources, *Water pollution control, *Water quality control, Biochemical oxygen demand, Indicator organisms, Coliforms, Pesticides, Chlorinated hydrocarbons, Heavy metals, Rivers, Nutrients, Nitrogen, Phosphorus, Phenols, Organic pollu-tants, Canada, Foreign research. Identifiers: Lower Fraser River, Vancouver(B.C.).

The information required for water quality management in a metropolitan area, specifically the Lower Fraser Estuary of metropolitan Van-couver, British Columbia, Canada, is discussed. The parameters to be considered in water quality management include dissolved oxygen, BOD, pollution indicator microorganisms (total coliforms, fecal coliforms, and fecal streptococci), nutrients (mainly nitrogen and phosphorus), trace metals, pesticides, and other toxic substances, such as hydrocarbons, phenols, and other organic compounds. The data collected show that pathogenic microorganisms, trace metals, and pesticides resulting from the metropolitan Vancouver area all present potential pollution problems. Information must be generated to determine the sources of must be generated to determine the sources of these pollutants if the quality of the water environ-ment in the Lower Fraser is to be managed. The in-formation presently available is inadequate for determining the sources and for developing management plans. Data from the California Bight and New York City are illustrated to show the importance of pollution source information in deter-mining whether the implementation of a particular management plan will be effective in producing the desired improvement in water quality. Current studies are being performed to provide a better understanding of the significant sources of these pollutants and the opportunities for their most cost-effective control. (See also W75-12350) (Orrept). FIRI.) W75-12354

CANADIAN DRINKING WATER SURVEIL-LANCE PROGRAMS, PANEL DISCUSSION, Nova Scotia Dept. of Public Health, Halifax. Div. of Public Health Engineering. C. E. Tupper.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 243-245.

Descriptors: *Potable water, *Water supply, Water quality, *Canada, Standards, Water treat-ment, Chlorination, Filtration, Corrosion control, *Water quality standards.
Identifiers: *Canadian Drinking Water Standards

The Canadian Water Standards and Objectives are currently used by each of the Atlantic provinces of Canada as either a legal requirement or as a reference guideline for evaluating and assessing municipal water supplied. All of the public systems in Prince Edward Island meet the Standards mainly because the public supplies there are all groundwater. In Nova Scotia, New Brunswick, and Newfoundland, the majority of public water supplies are surface water sources; many of these public systems cannot meet the requirements of the Standards during the winter. Upgrading of the public systems has included the installation of pH adjustment, filtration plants, and appropriate chemical feed systems for chlorination. Although there is a general soft water corrosiveness of the water, chemical quality is not a major problem in the Atlantic Provinces. The Canadian Standards can be achieved in the long run in these provinces without any difficulty. However, a period of several years will be needed to bring all systems to the desired quality level. The Canadian Drinking Water Standards and Objectives have been an important aid in establishing better drinking water surveillance programs in the Atlantic Provinces, and in encouraging an improvement in overall quality of the public water supplies. (See also W75-12350) (Orr-FIRL) W75-12355

CANADIAN DRINKING WATER STANDARDS REVIEW, ONTARIO'S PROGRAMS, PANEL DISCUSSION, Ontario Ministry of the Environment, Toronto.

Contingency Planning Section. G. H. Kay.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 247-252.

Descriptors: *Water treatment, *Potable water, Standards, Canada, Treatment facilities, Filtra-tion, Disinfection, Pathogenic bacteria, Groundwater, Surface waters, *Water quality standards. Identifiers: *Canadian Drinking Water Standards and Objectives.

A review is presented of the Canadian Water Standards with respect to the actions necessary to achieve these goals. The implementation of drinking water standards or objectives is highly desirable and permits a technical assessment to be made of the product being provided. The Ontario Ministry of the Environment is starting the E.D.P. storage and retrieval of water analysis results to accelerate the assessment of water quality. The Province of Ontario is initiating a program of training, leading to the mandatory certification of water treatment plant operators. Miniaturization of the treatment plant operators. Miniaturization of the sampling units would aid in organic chemical determinations. The Ministry is trying to protect the natural waters since the quality of the water source affects the quality of the drinking water. Legislation since 1957 has encouraged advanced treatment of waste flows and drinking waters. The presence-absence test, a simple modification of the most probable number method, is used in addi-tion to the multifilter technique to provide a sensitive test of the presence of pathogenic microorganisms. Other steps taken to ensure the best possible drinking water include: detection of asbestos fibers in drinking water by electron microscopy; monitoring organic chemicals; filtration as well as disinfection treatment is required of all surface water supplies; water reservoirs must be covered; automatic continuous recording analyzers for tur-bidity and chlorine residuals are required at filtration plants; and, regionalization is encouraged to discourage the growth of small plants. (See also W75-12350) (Orr-FIRL) W75-12356

CANADIAN DRINKING WATER STANDARDS REVIEW, ALBERTA, SASKATCHEWAN AND MANITOBA, PANEL DISCUSSION, Department of the Environment, 'Edmonton (Alberta). Div. of Pollution Control.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

R. N. Briggs.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 253-256.

Descriptors: *Potable water, *Water supply, Standards, Water quality, Canada, Ground water, Surface waters, *Water quality standards. Identifiers: *Canadian Drinking Water Standards and Objectives.

The Prairie Provinces of Canada, Alberta, Saskatchewan, and Manitoba, have accepted the Canadian Drinking Water Standards but due to physical limitations the Standards are used more like guidelines. The surface water and groundwater qaulity decreases from Alberta through Saskatchewan to Manitoba. The Province of Manitoba has adopted the Canadian Drinking Water Standard with the modification that their optimum fluoride level is 1.0 mg/liter, with an operating range from 0.8 to 1.2 mg/liter. Of the 199 water works systems in Manitoba, only 4 use water that meets the Water Quality Objectives, 24 use acceptable water, and the remaining 72% use water outside of the Standards. The Province of Sadkatchewan uses the values corresponding to the Maximum permissible limit in the Drinking Water Objectives. The Objective Values have been modified: sodium limit = 300 mg/liter; sulfate limite = 500 mg/liter; T.D.S. = 1500 mg/liter; hardness = 800 mg/liter; alkalinity = 500 mg/liter; and, phenolics = 0.001 mg/liter. The Province of Alberta has adopted the Canadian Drinking Water Standards, with the exceptions as determined by the Director of Standards and Approvals. (See also W75-12350) (Orr-FIRL) W75-12357

CANADIAN DRINKING WATER STANDARDS REVIEW, BRITISH COLUMBIA, PANEL DISCUSSION, British Columbia Dept. of Health, Vancouver. En-

British Columbia Dept. of Health, Vancouver. Environmental Engineering Div.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 257-261.

Descriptors: *Potable water, *Water supply, *Water quality standards, Standards, Canada. Identifiers: *Canadian Drinking Water Standards and Objectives.

The quality of the potable water supplies in British Columbia, Canada, and measures taken to protect the drinking water are discussed. The B.C. Health Branch has published 'Recommended Water Quality Standards', however, this document has no legal standing. The part of the standards dealing with workless water supplies in circular to the with potable water supplies is similar to the Canadian Drinking Water Standards. Very few of the water works systems in B.C. have full water treatment. Data processing storage and retrieval of waterworks information is just beginning to be im-plemented. An annual Water and Waste School is held at the University of British Columbia to produce well trained, competent operators for the waterworks systems. Open reservoirs on waterworks distribution systems must be covered or abandoned. The following programs must be in-itiated with supporting legislation and staff: con-trolled multiple use of watersheds to protect raw water quality; establishment of minimum drinking water quality standards for bacteriological, chemi cal and physical characteristics; prevention of contamination of water in the distribution system by cross-connection control programs, increasing water pressure, prohibiting open reservoirs, and promoting proper maintenance programs; con-solidation of small water systems into larger, better managed systems; and promotion of waterworks operator training and certification. (See also W75-12350) (Orr-FIRL)

CANADIAN DRINKING WATER STANDARDS REVIEW, NORTHWEST TERRITORIES AND YUKON TERRITORY, PANEL DISCUSSION, Environmental Protection Service, Edmonton (Alberta). Northwest Region.

J. W. Grainge.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, British Columbia, p 261-263.

Descriptors: *Water supply, *Potable water, *Water quality standards, Standards, Canada, Sewers.

Identifiers: *Canadian Drinking Water Standards and Objectives.

The control of water supplies in the two northern territories of Canada is discussed. The Canadian Drinking Water Standards are used as a guide for water quality. Half of the people in the two territories use water which meets, or nearly meets, the Standards. Most of the rest of the people have access to good quality water although the water is subject to contamination during haulage and storage. Bacterial contamination, color, and turbidity are the parameters which are not met in the substandard water. Water wells are fairly productive in the Yukon Territory but are not used in the Northwest Territories because of the high mineralization of the water. Administrative control of water quality in most communities is performed by self-governing councils which accept advice from the local offices of the Department of National Health and Welfare and the area MHO's and EHO's. The local health efficer should supervise the water sampling for bacteriological control and the testing for chlorine. The greatest need in the northern Canadian territories is for community planning so that water mains and sewers can be constructed. (See also W75-12350) (Orr-FIRL)

THE FLOATING COVER: BEST WAY TO COVER A FINISHED-WATER RESERVOIR, For primary bibliographic entry see Field 5F. W75-12360

GROUND WATER AND GROUND-WATER CONTROL., For primary bibliographic entry see Field 4B. W75-12386

SPECIALIZED UNDERGROUND EXTRACTION SYSTEMS.
For primary bibliographic entry see Field 8B.

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SYSTEMS APPROACH TO HYDROLOGY. For primary bibliographic entry see Field 2A. W75-12014

THE STRUCTURE OF INPUTS AND OUTPUTS OF HYDROLOGIC SYSTEMS, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W75-12017

A STUDY OF LONG RANGE RUNOFF SYSTEM RESPONSE BASED ON INFORMATION THEORY.

THEORY,
Kyoto Univ., (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12018

EFFICIENCY OF PARAMETER AND STATE ESTIMATION METHODS IN RELATION TO MODELS OF LUMPED AND DISTRIBUTED HYDROLOGIC SYSTEMS,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

For primary bibliographic entry see Field 2A. W75-12025

A BAYESIAN FRAMEWORK FOR THE USE OF REGIONAL INFORMATION IN HYDROLOGY, Resource Analysis, Inc., Cambridge, Mass.

G. J. Vicens, I. Rodriguez-Iturbe, and J. C.

Water Resources Research, Vol 11, No 3, p 405-414, June 1975. 12 fig, 4 tab, 18 ref. OWRT C-4118(9021)(9).

Descriptors: *Decision making, *Risks,
*Streamflow, *Regional analysis, Hydrology,
Statistical methods, Analytical techniques,
Stochastic processes, Regression analysis,
Hydrologic data, Streamflow.
Identifiers: *Bayesian methodology, *Model un-

Identifiers: "Bayesian methodology, "Model uncertainties, Synthetic generation, Prior probability distribution function, Maximum likelihood estimates.

Water resource designs are perfrect examples of decision making under uncertainty. In fact, three types of uncertainties may exist in any design problem: natural, parameter, and model uncertainties. The last two may be considered as informational uncertainties that are due to the lack of perfect information about the streamflow processes. The use of regional information has been sugested as a technique for reducing parameter uncertainties. The use of Bayesian methodology provides a framework for combining regional information with at-site historical records. Moreover, Bayesian methods allow the hydrologist to consider the parameter uncertainties as well as the natural uncertainties within the decision-making process. Because of these two advantages the Bayesian approach is a more complete and realistic approach to problems of uncertainty in hydrology and water resource planning than presently used methodologies. (Singh-ISWS) W75-12048

INPUT-OUTPUT ANALYSIS AND THE EN-VIRONMENT, University Coll. of Wales, Aberystwyth. Dept. of Economics. For primary bibliographic entry see Field 6G. W75-1217

6B. Evaluation Process

PLANNING MODELS FOR WATER SYSTEM DEVELOPMENT IN MISSISSIPPI COMMUNI-TIES, Mississippi Univ., University. Dept. of Economics

and Finance.
For primary bibliographic entry see Field 6D.
W75-11851

LIFE HISTORY, ECOLOGY, AND MANAGE-MENT OF THE CARP, CYPRINUS CARPIO LINNAEUS, IN ELEPHANT BUTTE LAKE. New Mexico Agricultural Experiment Station, University Park.

Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-10821, \$4.75 in paper copy, \$2.25 in microfiche. Research Report 273, January 1974. 80 p., 24 fig. 35 tab, 79 ref. NOAA CFRD 6-11-R.

Descriptors: *Life history studies, *Fish management, *Carp, Growth rates, Competition, Carpsucker, Fish behavior, Reservoirs, New Mexico, Rio Grande River, Spawning, Fish reproduction, Fecundity, Commercial fish, Chlorophyta,

Chrysophyta, Copepods, Market Crustaceans, Gill nets, Distribution, Buffalo fish, Fish diets, Fish diseases, Baits, Systematics, Sport fish, Fish harvest. Identifiers: *Elephant Butte Lake(New Mexico).

The classification, range, and local distribution of carp (Cyprinus carpio) are described in connection with studies of fishery resources in Elephant Butte Lake, New Mexico. The truism that carp and other rough fishes are limiting factors on game fish populations and that they contribute much less that their potential to human food supplies is confirmed. Investigated were the carp life history, its firmed. Investigated were the carp life history, its ecology, population dynamics and interactions in Elephant Butte Lake. Commercial fishes, including carp, comprised 20.9% of the relative density. The general declines in relative density and biomass of smallmouth buffalo, accompanied by variations in the parameters of carp, river carp-sucker, game and forage fish populations suggest certain effects of selective commercial harvest of buffalo on interactions within and between groups. The status of carp as a 'rough' and 'commercial' fish, its commercial value, and the need of simultaneous exploitation of buffalo, carpsucker, and carp to achieve a concurrent enhancement of sport fishing and utilization of 'rough fish' is discussed. Conclusions are that carpsucker and carp are con-trollable by commercial harvest and must be harvested along with buffalo. Four, five and 6-inch mesh nets, in medium brown color, are the most efficient for selection of 'rough' fish in a marketable-size. (Auen-Wisconsin) W75-11972

THE ASSESSMENT OF WATER QUALITY, Anacapa Sciences, Inc., Santa Barbara, Calif. For primary bibliographic entry see Field 5F. W75-12054

EXTERNALITIES AND PUBLIC GOODS. A BIBLIOGRAPHY,
Warwick Univ., Coventry (England). Dept. of

Economics.

R. S. Moreland.

Southampton University, Department of Economics, Environmental Economics Study Group Bibliography Series 2, June 1973. 10 p, 199

Descriptors: *Bibliographies, *Real property, *Welfare(Economics), Social aspects, Legal aspects, Political aspects, Taxes, Pollution abatement, Resource allocation, Government finance, Insurance, Optimization, Evaluation, Social

Identifiers: *Externalities, *Public goods. *Property rights.

This bibliography contains 119 references to topics on externalities and optimality, economics of pro-perty rights, demand and supply of public goods, external economics and diseconomies, public external economics and diseconomies, public goods and public policy, and theory of public expenditure. The articles were published between September 1931 and February 1973. (Becker-W75-12179

RECREATION ANALYSIS. A BIBLIOGRAPHY, Birmingham Univ. (England). Dept. of Transporta-tion and Environmental Planning. J. G. Gibson.

Department of Southampton University, Department Economics, Environmental Economics Stu Group Bibliography Series 4, July 1973. 243 ref.

Descriptors: *Bibliographies, *Recreation de-mand, *Economic impact, *Recreation, Fishing, Model studies, Use rates, Forecasting, Tourism, Inland waterways, Pricing, Sport fishing, Social aspects, Estimated benefits, Boating, Planning, Coasts, Recreation facilities, Cost-benefit analy-sis, Scenic highways, Property values, Social

value, Forests, Motivation, United States, Zoning, Rivers, Reservoirs, Financing, National parks, Land use, Welfare(Economics), Evaluation, Swimming.
Identifiers: United Kingdom, Ireland, England,

Wales, Scotland, City planning, Motoring

Over two hundred references related to the economics of recreation research are included in this bibliography. Two gaps in the bibliography are noted: references to tourism, and supply and policy studies of regional sports councils. The major topic included are: (1) British waterways-related recreation, (2) methods of estimating benefits from recreation, (3) methods of estimating the demand for recreation, (4) the valuation of fishery-related recreation, (5) urban vs. nonurban recreaother references are cited to various topics related to recreation. (Becker-Wisconsin) W75-12180

ECONOMIC GROWTH VS. THE ENVIRON-MENT. A BIBLIOGRAPHY, Bristol Univ. (England). Dept. of Economics.

For primary bibliographic entry see Field 6G. W75-12182

THE ECONOMICS OF CLEAN WATER. Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W75-12233

THOSE ELUSIVE 1985 WATER QUALITY For primary bibliographic entry see Field 5G. W75-12242

LIAISON WITH PLANNING AUTHORITIES-A

VITAL LINK, For primary bibliographic entry see Field 6E. W75-12335

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

NEED WAYS TO REDUCE DRILLING COSTS. For primary bibliographic entry see Field 8C. W75-11884

SEWER SYSTEM EVALUATION AND REHA-BILITATION COST ESTIMATES,

H. Farmer. Water and Sewage Works, Reference number, p 8-9, April 30, 1975.

Descriptors: *Sewers, *Construction costs, Cost allocation, Infiltration, Inflow, Waste water treat-

Identifiers: Sewer inspection, Sewer rehabilita-

A method is outlined for developing sewer system evaluation and rehabilitation cost estimates for in-filtration/inflow analyses. This cost estimation method is based on calculating rehabilitation costs for eliminating both excessive infiltration and inflow in a sewer system. Rehabilitation costs for in-filtration were determined to equal the sum of costs for each infiltration source and each man-hole reach to be grouted. A total inflow rehabilita-tion cost can be computed by adding the costs for individual inflow sources (such as from leakage or holes in manhole covers, foundation drains, catch basins, ditch or storm sewers, or area drains). A oasins, little of storm severs, of area trains). A complete sewer system evaluation survey consists of five phases: physical survey, rainfall simulation, preparatory cleaning, internal inspection, and survey report. An estimated cost of the complete survey is \$0.65 to \$0.95 per foot for the total length of the sewer system. A cost-effective evaluative survey is one where results of the physical survey and rainfall simulation are used to determine the actual sewer segments which require cleaning and internal inspection. It is recommended that actual costs of the evaluation be established by a cost plus a fixed fee, a fixed price, per diem, salary multiplier, or by a closed end contract. (Kramer-FIRL) W75-11951

WATER RESOURCES PROGRAMS IN THE SOUTHEASTERN REGION. Geological Survey, Atlanta, Ga. Water Resources

For primary bibliographic entry see Field 9D. W75-11960

SOLAR SEA THERMAL ENERGY. For primary bibliographic entry see Field 3E. W75-12196

THE ECONOMICS OF CLEAN WATER. Environmental Protection Agency, Washington, For primary bibliographic entry see Field 5G. W75-12233

6D. Water Demand

PLANNING MODELS FOR WATER SYSTEM DEVELOPMENT IN MISSISSIPPI COMMUNI-TIES.

Mississippi Univ., University. Dept. of Economics and Finance

E. W. Wood, and S. C. Shull.

Available from the National Technical Informa tion Service, Springfield, Va 22161, as PB-245 260, \$3.75 in paper copy, \$2.25 in microfiche. Mississip-pi Water Resources Research Institute, Mississippi State, Completion Report, 1975. 32 p, 23 tab, 1 fig. OWRT A-082-MISS (1).

*Mississippi, Data collections, Descriptors: *Water utilization, Mathematical Models, Planning, Water Supply, *Water demand, *Consumptive use, *Long-term planning, *Consumptive use, *L *Projections, Model studies.

The purpose was to develop a practical model whereby local government officials can project fu-ture water demand to facilitate economical long range planning. Water consumption data gathered from individual cities in Mississippi were compared by statistical techniques with other readily available data about the communities (population, income estimates, rainfall, temperature and so on) to determine what combination of factors can be used to project water consumption most accurately. Only readily available statistical comparisons were used because the models are to be used by local officials who will have limited sophistication in statistical techniques and limited time and funds to spend preparing the projections. (Orr-FIRL) W75-11851

WATER CONSUMPTION TRENDS WITHIN THE CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT,

Central and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept. A. Kreitman, R. H. Walker, and J. A. Beck. Technical Publication 74-3, May 1974. 32 p, 12 fig,

Descriptors: *Water utilization, *Consumptive use, *Water demand, *Florida, Use rates, Water supply, Aquifers, Groundwater, Hydrology, Climatology, Water requirements, Water sources, Water management(Applied).

Field 6—WATER RESOURCES PLANNING

Group 6D-Water Demand

The use (consumption) of potable water in southeastern Florida is of primary interest to planners, engineers, and the regulatory agency responsible for effective and efficient management of available water resources. The unique climatologic position southeastern Florida occupies was recognized, and the changes and range of per capita use of potable water supplies due in part to this uniqueness were examined. Per capita use of potable water in Florida, the South Atlantic Gulf Region, and the nation was compared with the per capita use in southeastern Florida. These studies indicated that per capita potable water use within the Central and Southern Florida Flood Control District has a rather broad range and centers about a significantly higher per capita use than is found in other parts of the state and nation. (Sims-ISWS)

SUPPLEMENTAL WATER USE IN THE EVER-

GLADES AGRICULTURAL AREA, Central and Southern Florida Flood Control District, West Palm Beach. Resources Planning Dept. For primary bibliographic entry see Field 3F. W75-12086

DESIGN AND OPERATING CRITERIA FOR

RURAL WATER SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering. G. L. Goodwin.

Available from the National Technical Informaston Service, Springfield, Va 22161, as PB-245 572, \$4.75 in paper copy, \$2.25 in microfiche. M.S. The-sis, May, 1975. 68 p, 27 fig, 4 tab, 16 ref. OWRT B-028-OKLA (1).

Descriptors: *Water distribution(Applied), *Rural areas, Water delivery, *Water demand, *Water users, *Water utilization, Domestic water, Dairy industry, *Design supply, Oklahoma. *Design criteria, Pumping, *Water

An analysis was made of the water usage in the Rural Water District No. 3 Payne County, Oklahoma. Customers were categorized on the apparent economic value of their residence and were classified as Class A, Class B, or dairies. The monthly usages of each of these groups were analyzed to obtain patterns of usage. The patterns of usage were then used to determine the values of daily demand and peak demand expected for type of user. There was a significant difference in the usage pattern for the three classes of customers. The average monthly usage per tap was 8768-19,138 gal for dairies, 4357-11,983 gal for Class A taps, and 2537-4160 gal for Class B taps. The average monthly usage per person ranged from 1424 to 2821 gal for Class A taps and from 989 to 1664 gal for Class B taps. Optimal design values for daily demand were 200 gal per Class B tap, 350 gal per Class A tap, 600 gal per Dairy tap, 12 gal per dairy cow milked, 90 gal per person for a Class B tap, and, 150 gal per person for a Class A tap. The optimal design values for peak demand were 1.3-1.8 gal per minute per Class A tap, and 0.6-0.9 gal per minute per Class B tap. The optimal period off-peak pumping time was from 10 p.m. to 7 a.m. (Orr-FIRL) W75-12126

RECREATION ANALYSIS. A BIBLIOGRAPHY, Birmingham Univ. (England). Dept. of Transporta-tion and Environmental Planning. For primary bibliographic entry see Field 6B. W75-12180

THOSE ELUSIVE 1985 WATER QUALITY GOALS.

For primary bibliographic entry see Field 5G.

6E. Water Law and Institutions

SUPPLEMENTAL WATER USE IN THE EVER-GLADES AGRICULTURAL AREA, Central and Southern Florida Flood Control Disrict, West Palm Beach. Resources Planning Dept. For primary bibliographic entry see Field 3F. W75-12086

THE EFFECT OF LEGISLATION OF THE FUTURE USE OF WATER IN THE LEATHER IN-DUSTRY, Water Pollution Research Lab., Stevenage

(England). For primary bibliographic entry see Field 5D. W75-12112

COAL MINE DRAINAGE POLLUTION-1973. Pennsylvania State Univ., University Park. Mine Drainage Research Section.
For primary bibliographic entry see Field 5G. W75-12114

STRONG IMPACT OF TEXTILES BY U.S. WATER CONTROL ACT, For primary bibliographic entry see Field 5G. W75-12117

REGULATORY ASPECTS OF SLUDGE UTILIZATION ON LAND,
Ontario Ministry of the Environment, Toronto.
Pollution Control Branch.
For primary bibliographic entry see Field 5G.
W75-12134

INTERNATIONAL ECONOMICS AND EN-VIRONMENT CONTROL, Univ. (England). Dept. Economics For primary bibliographic entry see Field 6G. W75-12178

EXTERNALITIES AND PUBLIC GOODS. A BIBLIOGRAPHY, Warwick Univ., Coventry (England). Dept. of For primary bibliographic entry see Field 6B. W75-12179

FISHERIES ECONOMICS. A BIBLIOGRAPHY, Manchester Univ. (England). Dept. of Agricultural Economics For primary bibliographic entry see Field 3E. W75-12181

OCEAN DUMPING OVERSIGHT. For primary bibliographic entry see Field 5G. W75-12194

BIG CYPRESS NATIONAL PRESERVE (PART For primary bibliographic entry see Field 6G. W75-12195

SOLAR SEA THERMAL ENERGY. For primary bibliographic entry see Field 3E. W75-12196

DIVERSION AND WITHDRAWAL OF ADDITIONAL WATER FROM LAKE MICHIGAN INTO THE ILLINOIS WATERWAY. For primary bibliographic entry see Field 4A. W75-12197

DEEPWATER PORT ACT OF 1974.
For primary bibliographic entry see Field 5G.

W75-12198

THE POTENTIAL FOR ENERGY PRODUC-TION FROM GEOTHERMAL RESOURCES. For primary bibliographic entry see Field 4B.

FEDERAL OCEAN PROGRAMS REVIEW.

Hearings--Subcomm. on Oceanography, Comm. on Merchant Marine and Fisheries, U. S. House of Representatives, 93d Cong, 2d Sess, March 26, 29, April 11, 1974, 343 p.

Descriptors: *Oceanography, *Oceans, *Project post-evaluation, *Atmosphere, *Administrative post-evaluation, "Almosphere, "Administrative agencies, Coordination, Legal aspects, Legislation, Management, Federal Government, Administration, Comprehensive planning, Bodies of water, Surface waters, Law of the sea, Marine biology, Marine fisheries, Sea water, Air environ-ment, Air pollution, Project planning, Projects, Environment, Aquatic environment.

Identifiers: *Congressional hearings,
*Environmental policy, Energy crisis, Interna-

tional agreements

Hearings were held by the House Subcommittee on Oceanography to consider the various aspects of the Federal Ocean Programs and the interagency coordination of ocean activities. Extensive testimony was received from the National Advisory Committee on Oceans and Atmosphere, which is required to undertake a continuing review of the progress of the marine and atmospheric science and service programs of the United States, and to submit a comprehensive annual report setting forth an overall assessment of the status of the Nation's marine and atmospheric activities. Particular attention was given to the Advisory Commitar attenuou was given to the Advisory Commit-tee's second annual report. The subcommittee ad-dressed itself in detail to all aspects of marine science activities and to the relationships of the various departments and agencies which have not received careful legislative review in the past few years. Since January 1969, several pieces of legislation and several administrative iniatives have occurred. The central question sought to be answered by the subcommittee was whether there has been adequate advancement on ocean problems as a result of these legislative and administrative initiatives. (Fernandez-Florida) W75-12200

1973 IMCO CONFERENCE ON MARINE POL-LUTION FROM SHIPS For primary bibliographic entry see Field 5G. W75-12202

THE FIFTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY.
Council on Environmental Quality, Washington, For primary bibliographic entry see Field 6G. W75-12203

USES OF SCIENTIFIC INFORMATION IN EN-VIRONMENTAL DECISION-MAKING, Indiana Univ., Bloomington, School of Law. For primary bibliographic entry see Field 6G. W75-12204

THE FEDERAL COMMON LAW OF ACCRETION: A NEW ELEMENT IN PROPERTY LAW, J. J. Walsh.

Louisiana Law Review, Vol 35, No 1, p 178-191 (1974). 14 p, 104 ref.

Descriptors: *Accretion (Legal aspects), *Boundaries (Property), *Common law, *Federal-state water rights conflicts, *Judicial decisions, Legal aspects, Bank erosion, Reliction, Avulsion, Boundary disputes, High water mark, Low water-

mark, Ownership of beds, Shores, Constitutional law, Jurisdiction, Federal jurisdiction, State jurisdiction, Land tenure, public rights, Riparian rights, Reservation doctrine, Riparian land, Water

Identifiers: *Reliction, Public trust doctrine, State

Rules governing real property and the question of ownership of accreted lands, traditionally has been considered the exclusive province of state law. However, federal in-roads have been made into the traditional common law rules of accretion by several recent United States Supreme Court decisions. This article focuses on the Court's approach to the question of ownership of accreted lands in relation to the potential effect on land titles. Discussion begins with a history of common law rights in water bottoms from the origins in early English law to the present Constitutional provisions granting control over navgatine the federal government, and reservation of the shores able waters and the underlying soils. The common law doctrines of accretion, reliction, and avulsion are explained. Universal to the common law was the rule that accretion belongs to the owner of the land to which it attaches. Generally, the federal courts have acknowledged the state law. Recently, the United States Supreme Court has applied a federal common law in certain instances to determine the rights of riparian landowners under the equal footing doctrine. The author concludes that this new approach involves a balancing of interests and is a laudable and flexible approach to the problem of ownership accreted lands along navigable waters. (Fernandez-Florida) W75-12205

THE DOCTRINE OF PRIMARY JURISDICTION MISCONCEIVED: END TO COMMON LAW EN-VIRONMENTAL PROTECTION, Florida Attorney General's Office, Tallahassee. For primary bibliographic entry see Field 6G. W75-12206

THE FLORIDA ENVIRONMENTAL PROTEC-TION ACT OF 1971: THE CITIZEN'S ROLE IN ENVIRONMENTAL MANAGEMENT, For primary bibliographic entry see Field 6G. W75-12207

POLLUTION CONTROL UNDER PENNSYLVANIA CLEAN STREAMS LAW, For primary W75-12209 ary bibliographic entry see Field 5G.

RIVER RESTORED: OREGON'S WIL-

AAMETTE, National Geographic Society, Washington, D. C. For primary bibliographic entry see Field 5G.

WASTING A RIVER, California Univ., Berkeley, Coll. of Natural Resources ary bibliographic entry see Field 6G. For primary W75-12211

LITIGATION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1974,

Environmental Law Inst., Washington, D.C. For primary bibliographic entry see Field 5G. W75-12212

DRAFT PROPOSAL FOR LEGISLATION TO CONTROL WATER POLLUTION FROM AGRICULTURAL SOURCES, For primary bibliographic entry see Field 5G. W75-12213

INTERNATIONAL LAW, U.S. SEABEDS POL-ICY AND OCEAN RESOURCE DEVELOP-

Virginia Univ., Charlottsville. K. Clarkson.

The Journal of Law and Economics, Vol 17, p 117-142 (1974). 26 p, 58 ref.

Descriptors: *Law of the sea, *International commissions, *Resource allocation, *Resources development, *United Nations, *United States, International waters, Water pollution control, Ju-

risdiction, Legal aspects.
Identifiers: *Coastal waters, *Territorial seas, *Non-navigational uses, Comparative law, Inter-national agreements, U.N. Convention on the In-ternational Seabed Area, Truman Proclamation, Seabed

Existing international agreements and institutions governing use of the ocean's resources are un-satisfactory. The allocative consequences of proposals under study need to be examined. Since certain ocean industries such as oil extraction and fishing conflict with each other, ownership of the seas is a crucial issue. This development renders the historical doctrine of 'freedom of the seas' obsolete. Since the early nineteenth century regulation of international fishing rights has mainly been accomplished by bilateral agreement. Inherent in most proposals is the idea that the net returns from the seas should be as high as possible. The require-ment of conflicting industries make this objective impractical. One proposal which attempts to resolve the problem is the U.S. draft articles to the U.N. on the Rights and Duties of States in the Coastal Seabed Economic Area (CSEA). The proposal grants to coastal states exclusive rights to nonnavigational use of the seabed. (Jenkins-Florida) W75-12214

THE INTEGRATIVE POTENTIAL OF THE PROPOSED INTERNATIONAL REGIME FOR THE SEABED.

Iowa Law Review, Vol 60, p 148-173, 1974. 26 p,

Descriptors: *Oceans, *International waters, *International law, *Jurisdiction, Water law, Water, Environment, Sea water, Water policy, Continential shelf, Economics, Exploitation, Mineralogy, Ecology, Ecological distribution, Economics, Prices, Resources, Environmental control, Environmental(Effects), Regime. Identifiers: International agreements, Territorial seas(Jurisdiction), Territorial waters.

Whether an international regime for the seabed develops a significant capability to make authoritative decisions for the international community depends to a great extent on how a number of major policy issues concerning the establish-ment of such a regime are resolved. Important issues which demand consideration are the limits of national jurisdiction, the powers of an international regime, the structure and voting of such a regime, and the enforcement of its decisions. There are three main categories of claims to national jurisdiction over the oceans: claims to territorial waters, claims to the continental shelf, and claims to economic resource zones. The resolution of issues concerning the powers of an internationl regime involves consideration of the exploitation of mineral resources, ecological powers, price controls, and distributors of economic aid. The utility of a seabed regime is manifested by the posutility of a seased regime is manufested by the pos-sibility of providing an orderly means for the ex-ploitation and minimization of the possibility of conflict over ocean resources. Such a regime could romote international cooperation and also play a major role in promulgating rules for environmental protection. Additionally, the concept that seabed resources are 'the common heritage of mankind' to be exploited only through an international regime may provide practical experience in joint decision-making which, if successful, will encourage future efforts in other areas. (Gagliardi-Florida) W75-12215

THE LAW OF THE SEA: A SELECTIVE BIBLIOGRAPHY OF ARTICLES, DOCUMENTS AND MONOGRAPHS, Columbia Univ., New York. School of Law.

J. T. Vambery.

Columbia Journal of Transnational Law, Vol 13, p 173-186, 1974. 14 p, 181 ref.

Descriptors: *Sea water, *Oceans, *International law, "International waters, Resources, Explora-tion, Exploitation, Water, Water law, Water pol-icy, Water resources, Water resources development, Water rights, Water users.

Identifiers: Coastal waters, International agreements, Territorial waters.

While the prospects for a universally binding law of the sea are uncertain, there is already a pressing need to begin long-term ocean resource exploration and expolitation. Several countries have unilaterally engaged in practices violative of existing international law. Other nations have been prompted to make unilateral regulations of some ocean uses in anticipation of generally acceptable future international regime of the seas. The Amer-ican Society of International Law has recognized the urgent need to find a temporary, but immediate, solution to the problems raised by ocean resource exploration and exploitation pending the adoption of a permanent international regime. The 1974 annual Philip C. Jessup International Moot 19/4 annual Phulp C. Jessup International Acceptable Court Competition presented a legal problem similar to that which will be faced by the United States Congress in enacting its current unilateral regulation bill, and by the international community in connection with its attempted enforcement. (Gagliardi-Florida) W75-12217

WYANDOTTE AND ITS PROGENCY: THE QUEST FOR ENVIRONMENTAL PROTECTION THROUGH THE ORIGINAL JURISDICTION OF THE SUPREME COURT,

Pepper, Hamilton and Schultz, Philadelphia, Pa. For primary bibliographic entry see Field 5G. W75-12218

THE ALLOCATION OF WATERS OF INTER-NATIONAL RIVERS. Georgetown Univ., Washington, D.C. Law

Center. Natural Resources Lawyer, Vol 7, p 45-66 (1974). 22 p. 105 ref.

Descriptors: *International waters. *International law, "Riparian rights, "River basin development,
"River basins, "Rivers, "International commis-sions, Water users, Technology, Water supply,

sions, water users, Technology, Water supply, Regulation. Identifiers: *Helsinki Rules, Limited territorial sovereignty, International Law Association, Equitable utilization(Doctrine), Territorial waters, Sovereignty, Third World.

Changing national boundaries and improved technology require a study of the law regarding in-ternational rivers. The prevailing position today is that nations must consider the effect of their river development on their riparian neighbors and com-pensate them for any resulting injury. The extent of these rights is governed by the doctrine of equitable utilization set forth by the International Law Association in the Helsinki Rules. Under this doctrine, each river basin state is entitled to a reasonable and equitable share in the beneficial use of waters of an international drainage basin. The term beneficial does not require that the most beneficial use be made of the waters, thus allowing states with differing technologies to share equally in the waters. The Rules also provide for appor-tioning water among competing interests based on

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prescribed factors. One problem yet to be resolved in reservation of water rights for future use. The Helsinki Rules do not recognize such a right. Developing riparian states have no guarantee that a minimum level of hydroelectric power will be available to operate plants under construction. Treaties present a possible solution to this problem because they deal with specific situations. (Jenkins-Florida)
W75-12219

THE DEVELOPMENT OF EUROPEAN RE-GIONAL LAW OF THE SEA, Naval Postgraduate School, Monterey, Calif.

M. W. Janis. Ocean Development and International Law Journal, Vol 1, p 275-289 (1973), 15 p. 1 tab, 34 ref.

Descriptors: *Sea water, *Oceans, *International law, International waters, International commissions, Fisheries, Fishing, Fish, Treaties, Continental shelf, Water, *Europe, Regime. Identifiers: Coastal waters, International agreements. Territorial waters

The development of regional law of the sea may be more practical than a new global order for the oceans and may be preferable to the extension of national maritime jurisdictions. The Common Market has taken two important steps toward creating a European system of maritime law-the European Economic Community (EEC) Common Fisheries Policy and the EEC Commission's decision applying the Treaty of Roue and EEC regulations to the continental shelf. The former opened national territorial waters within the EEC to all Community fishermen and provided the foundation for the generation of Common Market fishing policy. The latter brought the exploration and exploitation of hydrocarbons on the shelf within EEC regulations and supervision. Other European organizations (the Bow Group, the Council of European organizations (the Bow Group, the Council of European draious non-EEC regimes for maritime legislation and cooperation, but no non-EEC proposal seems likely to be implemented. The future of European law of the sea lies with the Common Market which can make an important contribution to European maritime order. If a European solution to maritime problems is not the global solution, it is still a model of regional cooperation for other areas of the globe. (Gagliardi-Florida)

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972, For primary bibliographic entry see Field 5G. W75-12221

THE RUSH FOR OFFSHORE OIL AND GAS: WHERE THINGS STAND ON THE OUTER CONTINENTAL SHELF.
For primary bibliographic entry see Field 5G. W75-12222

UNDERSTANDING THE OCEAN SCIENCE DEPARTS

DEBATE,
Woods Hole Oceanographic Institution, Mass.
H. T. Franssen.

Ocean Development and International Law, Vol 2, p 187-202 (1974). 16 p, 41 ref.

Descriptors: *Oceans, Technology, *Research and development, *Resources development, *Water resources, Research priorities, Water, Coasts, Water law, Water policy, Water rights, Resources. Identifiers: Coastal waters, Coastal zone management, International agreements, State policy.

Several spokesmen for the American ocean science community have indicated their approval of providing technical assistance in the marine sciences to developing countries in return for uncontrolled access to coastal waters beyond narrow territorial limits for scientific research. The author doubts whether technical assistance will work as a quid pro quo for obtaining unrestricted access to the proposed resource since developing countries, which have expressed a strong desire to control foreign-conducted research in the proposed resource zone are not likely to relinquish sovereign rights over parts of their claimed 'national territory' for a vague promise of technical assistance. Additionally, nations move through various stages of scientific and technological development from complete dependence on foreign science and technology to the development of an independent scientific tradition. There is historical evidence to suggest that when nation are progressing in the direction of an indigenous scientific capability they tend to restrict access to their national territory. When the transition towards an independent scientific capability has been completed, restrictions on foreign conducted science tend to subside. Because most developing countries are now somewhere between the stage of complete dependence on foreign science and the final independent state, restrictions on foreign conducted oceanic research are likely to grow within their national territories. The offer of technical assistance in the marine sciences is not likely to change their positions. (Gagliardi-Florida)

ARE WE ANY NEARER TO AN INTERNA-TIONAL AGREEMENT ON USE OF THE SEAS, Rhode Island Univ., Kingston. Graduate School of Occanography.

J. A. Knauss. Maritimes, Vol 18, No 4, p 4-7, November 1974. 4 p, 1 map.

Descriptors: *Conferences, *Treaties, *International law, United States, Coasts, Fish, Fish management, Fisheries, Fishing, Oil, Deep water, International waters.

Identifiers: International agreements, Coastal waters, Territorial seas(Jurisdiction), Territorial waters.

Although the recent Law of the Sea Conference in Caracas failed to produce a single paragraph of the proposed international treaty, great progress may nevertheless have been made in the ten weeks of negotiations. Because of the complexity of the issues and the wide range of interests, most nations are unprepared to formally agree on issues before receiving reasonable assurance of the nature of the agreement on all other related issues. There is nearly universal agreement on a 12-mile territorial sea. Both the U.S. and the U.S.S.R. announced in Caracas their readiness to accept, a 200-mile zone in which the coastal nation would control its economic resources, including fish and oil. At issue are the so-called residual rights, those not explicitly considered, which might become significant in the next half-century. All nations are agreed on international control, but the degree of control is at issue. If agreement is to be attained, no nation will be able to emerge from the negotiations without making substantial compromises. It is suggested that if agreement is not reached in 1975, it will be increasingly difficult to do so in succeeding years, because a number of countries, including the U.S., will move unilaterally in such areas as fishing, deep-sea mining and vessel pollution control. (Gagliardi-Florida)

WE'RE FIGHTING OIL POLLUTION WITH BUBBLES, BELTS AND BEADS, For primary bibliographic entry see Field 5G. W75-12225

HISTORICAL GUIDE TO FEDERAL WATER POLLUTION CONTROL LAWS AFFECTING FOOD PROCESSING, Economic Research Service, Washington, D.C.

For primary bibliographic entry see Field 5G. W75-12226

FLOOD INSURANCE AND FLOOD PLAIN ZON-ING AS COMPATIBLE COMPONENTS, Clark Univ., Worcester, Mass. Dept. of Geography. For primary bibliographic entry see Field 6F. W75-12227

OVERLAND FLOW: ANSWER TO WATER CLEANUP CHALLENGE.
Louisiana State Univ., Baton Rouge. Office of Sea

Grant Development.
For primary bibliographic entry see Field 5D.
W75-12228

THE DEEPWATER PORTS ACT OF 1974; HALF SPEED AHEAD,
For primary bibliographic entry see Field 5G.

W75-12229

TOXIC WATERS (DISCUSSION OF RECENT FEDERAL ACTION AGAINST WATER POLLUTION).

Resources for the Future, Inc., Washington, D.C. For primary bibliographic entry see Field 5G. W75-12230

TOWARD A CLEANER AQUATIC ENVIRON-MENT,

Environmental Protection Agency, Washington, D. C. Office of Air and Water Programs. For primary bibliographic entry see Field 5G. W75-12234

LIABILITY FOR OIL POLLUTION DISASTERS: INTERNATIONAL LAW AND THE DELIMITATION OF COMPETENCES IN A FEDERAL POLICY,

Syracuse Univ., N. Y. Coll. of Law. For primary bibliographic entry see Field 5G. W75-12235

LAND USE CONTROLS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT: A CTTIZEN'S GUIDE, National Resources Defense Council, Washington, D. C.

For primary bibliographic entry see Field 5G. W75-12237

1974 ANNUAL REPORT, GREAT LAKES BASIN COMMISSION.
Great Lakes Basin Commission, Ann Arbor,

Mich. For primary bibliographic entry see Field 5G. W75-12238

OREGON SURVEYS ITS HAZARDOUS WASTES, Oregon State Dept. of Environmental Quality, Portland.

For primary bibliographic entry see Field 5G. W75-12239

CORPS' GUIDELINES FOR DAM SAFETY IN-SPECTION NEED REVAMPING, Tennessee Valley Authority, Knoxville. Flood

Control Branch.
For primary bibliographic entry see Field 8A.
W75-J2241

TOUGH SOLID-WASTE LAWS BREWING ON CAPITOL HILL.
For primary bibliographic entry see Field 5G.

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NEPA SETTLEMENT: CONSERVATION DUNCIL OF NORTH CAROLINA V. COUNCIL

FROEHLKE, Northwestern Univ., Evanston, Ill. School of

Environmental Law Reporter, Vol 5, p 50079-50087 (1975). 9 p, 55 ref.

Descriptors: *North Carolina, *Water control, *Dams, *Dam construction, *Reservoirs, *Flooding, *Judicial decisions, Administrative agencies, Administration, Water quality, Water conservation, Environmental effects, Damsites, **Description** conservation, Environmental effects, Damsites, Eutrophication, Federal government, Water resources development, Federal project policy, Hydroelectric power.

Identifiers: Environmental impact statements, Na-tional Environmental Policy Act, Consent judge-ment, Administrative regulations.

Plaintiff filed a motion in federal district court for Plantar rife a motion in reducing distribution injunctive and declaratory relief against the construction by New Hope (now B. Everett Jordan)
Dam by the Corps of Engineers, on the ground that the defendants violated the procedural and substantive requirements of the National Environ-mental Policy Act of 1969. Plaintiffs argued that the benefits of the project were outweighed by the destruction of wildlife, pollution, and eutrophica-tion of the reservoir that would result from the flooding. Defendants admitted these problems in an environmental impact statement, but concluded that additional treatment facilities would remedy the problems. The district court denied plaintiffs motion for an injunction because defendant had complied with the procedural requirements of the Act. On appeal, the Fourth Circuit remanded for a consideration of whether the substantive requirements of a good faith consideration of environmental factors had also been met. Due to the protracted litigation, a consent settlement was reached which permitted completion of the dam but halted construction of a permanent conservation pool. A supplemental environmental impact study of the reservoir water quality aspects of the project was to be filed in two years. A final deci-sion on the reservoir would be made at that time. This type of consent judgment is unique in environmental litigation. (Jenkins-Florida) W75-12244

THE WATER POLLUTION PERMITTING

SYSTEM, Union Bank and Trust Co., Montgomery, Ala. For primary bibliographic entry see Field 5G. W75-12245

ENFORCING INTERNATIONAL LAW: U.S. AGENCIES AND THE REGULATION OF OIL POLLUTION IN AMERICAN WATERS, Maryland Univ., College Park. Dept. of Political

For primary bibliographic entry see Field 5G. W75-12246

PROPERTY (WETLANDS REGULATION), R. Ketchum, and D. W. Schmitz.

Annual Survey of American Law, 1973/74 Vol, p 307-318 (Winter 1974). 7 p, 53 ref.

Descriptors: *Wetlands, *Coastal marshes, *Freshwater marshes, *State jurisdiction, Administrative agencies, Governmental interrelations, Federal jurisdiction, Reservation doctrine, Eminent domain, Judicial decisions, Compensation, Cost repayment, Condemnation value. Identifiers: *Police power.

Preservation of coastal wetlands, lying between dry and permanently submerged lands, is being implemented through limits on dredging, filling and construction in these marshy areas. Regulations destroying the value of the property have been construed as takings of property without compensation, frustrating in many instances state regula-tory programs. Recent cases, however, have sustained state legislative programs as protective of a valid domestic interest, constituting a valid exercise of the state's police power. Two courts that have decided the issue based their holdings on entirely different rationale. The Maryland Court of Appeals formulated a three-pronged test based upon protection of the public generally, in a reasonably necessary manner, but not unduly op-pressive. The Supreme Court of Wisconsin upheld the questioned legislation on the ground that it constituted a restraint imposed to prevent public harm, and thus a noncompensable regulation. (Knocke-Florida)

ADMIRALTY'S POWER IN RE OIL POLLU-TION (STATES ABLE TO SET MORE STRIN-GENT PENALTIES), For primary bibliographic entry see Field 5G. W75-12248

A PROPOSAL FOR THE QUANTIFICATION OF RESERVED INDIAN WATER RIGHTS,

S. M. Campbell. Columbia Law Review, Vol 74, No 7, p 1299-1321 (1974). 23 p, 115 ref.

Descriptors: *Indian reservations, *Water rights, *Water law, *Appropriation, *Treaties, *Water allocation(Policy), Legal aspects, Water resources development, Federal-state water rights conflicts, Water measurement, Water policy, Pueblo water rights, Water supply, Water users, Reservation doctrine, Federal jurisdiction.

Identifiers: *Water quantification, *State policy, *Indian water rights, Western states, Water scarcity.

The indefinite nature of Indian reserved rights has made state water resource planning difficult. While courts have recognized that Indian reservations have reserved water rights paramount to even non-Indian prior appropriations, there has been no attempt to quantify those rights. The leading case recognizing Indian rights referred to sufficient future requirements. The federal government has proved to be an unsatisfactory if not arbitrary, advocate of Indian interests. Fixing Indian water rights at present requirement levels with periodic review of changing needs is the best solution. The basis for allocation should be beneficial use rather than only agricultural use. The sale or lease of In-dian water rights is practicable when water cannot be put to use on reservation land. The most dif-ficult part of a quantification plan is dealing with changes in the place and nature of water use. Restricted, reasonable changes in the nature of use should be permitted when there is no unduly adverse effect on the rights of non-Indian appropria-tors. A periodic review of Indian needs and preuses can accomplish this objective. Inventory and quantification of Indian water rights should be conducted by a neutral federal body divorced from the Justice Department and the Department of the Interior. (Jenkins-Florida) W75-12249

RECOGNITION OF SUBSTANTIVE RIGHTS UNDER NEPA, California State Water Resources Control Board,

Sacramento. R. B. Robie

Natural Resources Lawyer, Vol 7, No 3, p 387-437 (1974). 51 p, 249 ref.

Descriptors: *Public rights, *Water policy, *Water resources development, Federal jurisdiction, Federal government, Constitutional law, Administrative decisions, Institutional constraints, Environmental effects, Administrative agencies,

Identifiers: *NEPA, *Private substantive rights, Standing, Burden of proof.

The most important contribution of the National Environmental Policy Act may be the encouragement of review of governmental actions, through recognition of judicially enforceable substantive rights held by the public. Section 101 of the Act, on policy, section 102 on implementation and the Council on Environmental Quality promote recog-nition of these rights, which arguably attain con-stitutional scope through the Fifth, Ninth and Fourteenth Amendments. Specifically, the right to prevent environmentally harmful federation actions may be limited by definition of the nature of the environmental right, standing, burdens of proof and difficult questions of fact. The author reviews recent case law and administrative deci-sions relating to possible substantive rights under the Act. (Knocke-Florida) W75-12250

MANAGEMENT OF INTERSTATE GROUND

Fischer and Beatty, Fort Collins, Colo. For primary bibliographic entry see Field 4B. W75-12251

INFORMATION REPORT ON THE LAW OF THE SEA: UNDERSTANDING THE DEBATE OF THE LAW OF THE OCEAN SPACE.

The International Lawyer, Vol 8, No 4, p 688-723 (1974). 34 p, 6 ref.

Descriptors: *International waters, *Commercial fishing, *Foreign trade, *International law, Fish management, International commissions, Mineral industry, Navigation, Military aspects, Reasonable use, Continental shelf, Law of the sea.

Identifiers: *International regulatory, *International licensing.

The law of ocean space recognizes a wide variety of geopolitical and international interests and priorities. The territorial sea as an economic resource is only the beginning of a broad economic zone of interest. Support is growing for a limit of 12 miles, conditioned on free right of transit over the zone. Innocent passage, not prejudicial to peace or security of the coastal state, excludes some vessels as well as overflight rights, and an emerging concept of free transit has been proposed by the United States. High seas fishery management presently involves open access governed by re-gional fishery conventions and ad hoc reactions to such crises as territorial water conflicts. The United States has proposed species regulation and environmental definitions of national interests in this area. Seabed rights might best be managed by use of economic zones, international revenue sharing, pollution control, compulsory dispute set-tlement, and assurance of investment monies, although precise definition of Continental Shelf lands is difficult. With respect to international waters, the United States supports group international licensing, versus international agencies or regulations. Pollution control of land runoff, airborne chemicals and ocean activities is susceptible to essentially the same range of regulatory alterna-tives, including possible economic zone definition followed by international regulation. (Knocke-Florida) W75-12252

BASIC PRINCIPLES RELATING TO THE IN-TERNATIONAL REGIME OF THE OCEANS AT THE CARACAS SESSION OF THE U. N. LAW OF THE SEA CONFERENCE, International Bank for Reconstruction and Development, Washington, D.C.

Journal of Maritime Law and Commerce, Vol 6, No 2, p 213-247, 1975. 35 p, 77 ref.

Descriptors: *Conferences, *Regime, *Law of the sea, *United Nations, *Beds under water, Beds, Regulation, Productivity, Technology, Interna-tional law, Foreign trade, Foreign waters, Govern-

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ments, International waters, International commissions, Research and development, Treaties, Channel morphology, Flow, Flow profiles, Identifiers: *International agreements.

This article reviews the work done in Committee 1 of the Third United Nations Conference on the Law of the Sea held in Caracas in the summer of 1974. Generally, the theme of Committee efforts was the international regime and machinery for the international seabed area. This review critically analyzes the proposals presented to the Commit-tee and the texts which it drafted. Existing differences between states on various issues which came before the Committee are identified and examined. Approaches to compromise solutions and the use of negotiators are considered. The procedure and proceedings of the Committee are outlined. Basic problems discussed include: delimitation of the international seabed area, regulation of production in the international seabed area, transfer of technology, and protection of the marine environment. The author states that there are more areas in dispute than in agreement concerning the international regime of the interna-tional seabed. He concludes that there must be more flexibility and less insistence on extreme positions at the Conference table if agreement is to be reached. (Fernander Florida) be reached. (Fernandez-Florida) W75-12253

A SOLUTION TO THE PROBLEM OF PRIVATE COMPENSATION IN OIL DISCHARGE SITUA-

For primary bibliographic entry see Field 5G. W75-12254

WATER BANK PROGRAM.

Soil Conservation Service, Washington, D. C. Federal Register, Vol 37, No 216, p 23729, November 8, 1972. 1 p.

Descriptors: *Farms, *Agricultural watersheds, *Legislation, *Drainage, *Land management, Water conservation, Soil conservation, Water policy, Controlled drainage, Regulation. Identifiers: *Water bank program.

This notice of proposed Water Bank Program amendments was published to afford interested persons an opportunity to convey their views concerning the proposed changes. The amendments redefine the Program's geographical applicability ment the dishibitions interested the proposed of the dishibitions of the dishibition of the dishibit redefine the Program's geographical applicability and the eligibility requirements for a farm to par-ticipate in the program. The amendments also place certain restrictions on land designated eligi-ble for the program. All comments and suggestions regarding the proposals were to be received by the Director of the Land Use Division within thirty days after publication of the notice. (Hoffman-Florida) W75-12259

WATER QUALITY MANAGEMENT BASIN PLANS-POLICIES AND PROCEDURES. Environmental Protection Agency, Washington,

D. C. For primary bibliographic entry see Field 5G. W75-12260

MARINE SANCTUARIES. National Oceanic and Atmospheric Administra-tion, Washington, D.C. Federal Register, Vol 39, No 125, p 23254-23257, June 27, 1974. 4 p.

Descriptors: *Administrative agencies, *Coasts, *Regulation, *Preservation, *Aquatic life, Marine animals, Marine fish, Oceans, Marine plants, Administration, Federal government, State governments, Education, Legal aspects, Management, Conservation, Control, Protection, Water law, Water management(Applied), Water policy, Water resources, Recreation, Ecology, Aesthetics.

Identifiers: *Marine sanctuaries, *Administrative regulations, *Environmental policy, *Coastal zone management, National Oceanic and Atmospheric Administration, Hazardous substances(Pollution),

The National Oceanic and Atmospheric Administration hereby establishes guidelines, pursuant to Title III of the Marine Protection and Research Act of 1972, setting forth the procedure by which areas may be nominated as marine sanctuaries. These guidelines set forth the concepts, policies, procedures for the processing of nominations and the selection, designation and operation of a marine sanctuary. Sanctuaries may be designated to preserve, restore, or enchance areas for their conservational, recreational, ecological, research, or esthetic values in coastal waters. Multiple use is provided for in each category to the extend compatible with the primary use of the sanctuary. Nomination of sanctuaries is to be effected through federal, state, or local studies. Enforcement of this regulation will be carried out by the imposition of civil penalties. Marine sanctuaries will be established to preserve, protect, and manage essential habitats, and esthetic and unique to conserve certain species; or to promote scientific research, education, and recreation. (Fernandez-Florida) W75-12261

ESTUARINE SANCTUARY GRANTS-APPLICA-SELECTION TION AND PROCEDURES CRITERIA

National Oceani and Atmospheric Administration, Rockville, Md. Federal Register, Vol 39, No 46, p 8924-8927, March 7, 1974. 4 p.

Descriptors: *Administrative *Estuarine environment, **Coasts, Federal government, Regulation, State governments, Education, Research facilities, Aquatic habitats, Bays, Estuarine fisheries, Indets(Waterways), Intertidal areas, Environment, Aquatic environment, Projects, Research and development, Government finance, On-site development, Government finance, On-site laboratories, Laboratories. Identifiers: *Administrative regulations, *Coastal zone management, Coastal water

The National Oceanic and Atmospheric Administration hereby gives notice of proposed guidelines to establish policy and procedures for the nomination, selection, and management of estuarine sanc-tuaries as authorized under sections 312 and 314 of the Coastal Zone Management Act of 1972. Th the Coastal Zone Management Act of 1972. These guidelines establish a program which '... provides grants to states on a matching basis to acquire, develop, and operate natural areas as estuarine sanctuaries...', for the purpose of scientific examination of ecological relationships. The primary use of estuarine sanctuaries will be to provide interest of the purpose formation essential to coastal zone management. Natural field laboratories are to be established to gather data and make studies of the natural and human processes occuring within the uman processes occuring within the estuaries of the coastal zone. Zoogeographic classification will reflect differentiation and a variety of ecosystems to include all significant variations. Each individual program must interact with the overall coastal zone management program. The manner of application, criteria for selection, and method of use of the grants are delineated. (Fernandez-Florida) W75-12262

PERMITS FOR ACTIVITIES IN NAVIGABLE WATERS OR OCEAN WATERS.
Corps of Engineers, Washington, D. C. Federal Register, Vol 39, No 65, p 12115-12137, April 3, 1974. 23 p, 7 append.

Descriptors: *Administrative agencies, *Regulation, *Permits, *Structures, *Navigable waters, Navigable rivers, Dams, Dikes, Bridges,

Bodies of water, Navigation, Legal aspects, Water law, Water permits, Water rights, Canals, Oceans Legislation, government. Identifiers: River and Harbors Act, Federal *Administrative regulations. Navigational obstructions, Corps of Engineers.

The Department of the Army, acting through the Corps of Engineers, is publishing final regulations which prescribe the policies, practice, and procedures to be followed in the processing of applications for permits authorizing structures and work in or affecting navigable waters of the United States, the discharge of dredged or fill materials into navigable waters, and the transportation of dredged material for the purpose of dumping it into ocean waters. These regulations are issued pursuant to the authority of the Rivers and Harbors Act which prohibits the construction and Harbors Act which prohibits the construction of any dams or dikes across any navigable waters in absence of approval by the Chief of Engineers and the Secretary of the Army. Activities requiring authorization are all structures of work in navigable waters except for bridges and causeways, the placement of aids to navigation by the Coast placement of aids to navigation by the Coast Guard, and structures constructed in artificial canals within principally residential developments. The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed structure or work and its intended use on the public interests. (Fernandez-Florida) W75-12263

IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS. Environmental Protection Agency, Washington, For primary bibliographic entry see Field 5G. W75-12264

CANNED AND PRESERVED PROCESSING POINT SOURCE CATEGORY-EFFLUENT LIMITATIONS GUIDELINES. Environmental Protection Agency, Washington, For primary bibliographic entry see Field 5G. W75-12265

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS AND PROPOSED LIMITATIONS. invironmental Protection Agency, Washington, D.C. For primary bibliographic entry see Field 5G. W75-12266

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS. Environmental Protection Agency, Washington, For primary bibliographic entry see Field 5G. W75-12267

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS AND PROPOSED APPLICATION TO PRI JEAT-MENT STANDARDS. Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W75-12268

SOAP AND DETERGENT MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT LIMITATIONS GUIDELINES. Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W75-12269

Water Law and Institutions-Group 6E

TIMBER PRODUCTS--PROPOSED EFFLUENT GUIDELINES AND PERFORMANCES AND PRETREATMENT STANDARDS FOR NEW SOURCES.

Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W75-12270

FERTILIZER MANUFACTURING SOURCE CATEGORY-EFFLUENT LIMITATIONS AND GUIDELINES.
Environmental Protection Agency, Washington

D.C. For primary bibliographic entry see Field 5G.

MEAT PRODUCTS POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STAN-DARDS.

Environmental Protection Agency, Washington, D.C.

For primary bibliographic entry see Field 5G. W75-12273

GRAIN MILLS POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS.

Environmental Protection Agency, Washington, D.C.

For primary bibliographic entry see Field 5G. W75-12274

PLASTICS AND SYNTHETIC POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS.

Environmental Protection Agency, Washington, D.C.

For primary bibliographic entry see Field 5G. W75-12275

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY-EFFLUENT GUIDELINES AND STANDARDS AND PROPOSED LIMITATIONS. Environmental Protection Agency, Washington,

Environmental Protection Agency, Washington, D.C.

For primary bibliographic entry see Field 5G. W75-12276

INTRODUCTION OF BILLS TO AUTHORIZE THE REPLACEMENT OF THE AMERICAN FALLS DAM IDAHO.

FALLS DAM IN IDAHO.
Congressional Record, Vol 199, No 56, p 5691056911 (daily edition, April 10, 1973). 2 p.

Descriptors: *Idaho, *Dams, *Dam construction, *Dam foundations, *Concrete structures, Water storage, Flood control, Dam failure, Engineering geology, Safety factors, Legislation, Federal government.

Identifiers: American Falls Dam, Federal water rights.

Two bills were introduced providing alternative proposals for construction of a repalcement dam for the existing American Falls Dam in Idaho. Because of chemical reactions within the structure, the dam has deteriorated to the extent that it no longer meets current safety standards. Consequently, service restrictions have been placed on the storage level of the reservoir, putting the dam-dependent basin in a precarious situation. The first bill would authorize the Secretary of the Interior to construct and operate a replacement dam under the reclamation program. Its major drawback is the time delay associated with governmental appropriations. The second bill would allow the water users to finance and construct the dam without federal assistance, with the Secretary of the Interior taking title to the dam upon completion. This bill would greatly reduce the vital time

factor, although it would deprive the water users of the benefit of federal financial assistance. (Hoffman-F¹orida) W75-1278

INTRODUCTION OF SHORE EROSION CONTROL LEGISLATION.

Congressional Record, Vol 119, No 9, p H307-H308 (daily ed. January 18, 1973). 2 p.

Descriptors: *Beach erosion, *Shore protection, *Soil erosion, *Great Lakes, Legislation, Washouts, Bank erosion, Recreation facilities, Government finance, Coastal engineering, Tidal effects, Waves(Water).

Identifiers: Beachfront, Welland canal.

The purpose of the proposed legislation is to provide federal assistance to protect privately-owned shore property from erosion. The bill's sponsor noted that current high water levels in the Great Lakes area, together with Canada's closing of the Welland Canal for repairs has critically aggravated this situation in his own district. He also introduce data from a report estimating the financial impact of future shore crosion on a four-mile strip with respect to private property owners and state tax revenues. The report also stated that the cost of providing necessary protection to the shorelines would be prohibitive for private owners. This legislation would provide the necessary federal financing for such a project, hopefully preventing the future loss of real property, the depletion of tax resources, and the loss of recreational areas and scenic beauty. (Hoffman-Florida)

INTRODUCTION OF S433 (BILL FOR SAFE DRINKING WATER).
Congressional Record, Vol 119, No 9, p S860-S864

Congressional Record, Vol 119, No 9, p S860-S864 (daily ed. January 18, 1973). 5 p.

Descriptors: *Potable water, *Water purification, *Water quality, *Public health, Domestic water, Standards, Water policy, Legislation, Grants, Governmental interrelations, State governments, Water supply, Federal government, Freshwater, Public health, Environmental sanitation. Identifiers: *Safe Drinking Water Act, *Rural water surveys, *Water supply occupations.

This legislation was introduced to help assure high quality drinking water. The bill's sponsor noted that a recent Environmental Protection Agnecy (EPA) report showed that over 8 million people are served water which fails to meet mandatory requirements set by the federal government with respect to interestate carrier systems. The proposed bill would authorize the EPA to establish minimum federal drinking water standards prevailing maximum limits for contaminants as well as standards for the operation and maintenance of drinking water system. These standards would be enforced by the individual states, which would receive federal grants to aid in enforcement. In addition, a National Drinking Water Council would be established to give advice on scientific and enjeneering matters. The bill would also authorize several projects, such as the promotion of water supply occupations, the conducting of a rural water survey, and a grant program to study new water supply technology. Finally the bill would authorize citizen suits against violators of drinking water standards and against the Administrator for failing to perform mandatory duties. (Hoffman-FLorida)

UNITED STATES V. CAPPAERT (ACTION FOR DECLARATION OF RIGHTS OF UNITED STATES TO UNDERGROUND WATERS APPURTENANT TO DEVIL'S HOLE, DEATH VALLY NATIONAL MONUMENT).
508 F.2d 313-322 (9th Cir. 1974). 10 p.

Descriptors: "Judicial decisions, "Overlaying proprietor, "Groundwater, "Water rights, "Reservation doctrine, Water, Water allocation(Policy), Water conservation, Land tenure, Legal review, Legal aspects, Public rights, Water law, Riparian rights, Competing uses, Water loss, Water holes, Water levels, Water supply, United States, Federal government.

Identifiers: "Implied reservation, Presidential

Identifiers: *Implied reservation, Presidential proclamation.

An action was brought by the United States for a declaratory judgment regarding underground waters appurtenant to Devil's Hole, Death Valley National Monument. Pupfish, which have been declared a unique and endangered species, live in Devil's Hole. The district court limited the amount of water which the owners of nearby cattle ranches may withdraw. Devil's Hole was made part of a national monument by Presidential Proclamation. The government contended that the Proclamation, with its express preservation of Devil's Hole pool and the surrounding land from the public domain, contains an implied reservation of enough groundwater to assure preservation of the pupfish in that pool. The ranchers, argued that the doctrine of implied reservation of water does not apply to groundwater, but only to surface water. The court held that the doctrine of implied reservation applies to groundwater, and that the presidentail proclamation withdrawing the area from the public domain impliedly reserved rights in the groundwater sufficient to maintain the pool. (Fernandez-Florida)

CONSERVATION SOC'Y. OF SOUTHERN VERMONT, INC. V. SECRETARY OF TRANSPORTATION (REVIEW OF MOTION FOR EQUITABLE INJUNCTION AGAINST STREAM CHANNELIZATION PROJECT).

508 F. 2d 927-939 (2d Cir. 1974). 13 p.

Descriptors: "Highways effects, "Judicial decisions, "Administrative agencies, "Federal government, "Project feasibility, Feasibility, Project planning, Planning, Financing, Government finance, State governments, Environmental effects, Environment, Ecology, Highways, Effects legal aspects, Equity, Federal jurisdiction, Water law, Legislation, Administration, "Vermont. Identifiers: "Environmental Impact Statment, "Injunctive relief, "National Environmental Policy Act, Environmental policy.

Environmental groups objecting to proposed Vermont highway construction sought injunctive relief against state and federal highway officials, for alleged violations of the National Environmental Policy Act (NEPA). Plaintiffs alleged procedural and usbstantive violations of NEPA, in that, the draft and final environmental impact statement (EIS) were prepared by the state agency rather than by the federal agency. On appeal the Second Circuit held that an EIS must be prepared by the responsible federal agency, and that the Federal Highway Administration must formulate and prepare its own impact statement to assess environmental effects of proposed federally-funded highway projects. The court, however, affirmed the lower court's refusal to grant an injunction based upon its discretionary power. (Fernandez-Florida)

UNITED STATES V. DEXTER CORP. (APPEAL BY SANITARY DISTRICT FROM CONVICTION FOR DISCHARGE OF MANUFACTURING REFUSE INTO NAVIGABLE WATERS). 507 F. 2d 1038-1041 (7th Cir. 1974).

Descriptors: *Industrial wastes, *Rivers and Harbors Act, *Judicial decisions, *Law enforcement, *Municipal wastes, Wastes, Sewage, Waste disposal, Waste water treatment, Water pollution, Water pollution sources, Legislation, Legal

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aspects, Water law, Federal government, cities, Federal jurisdiction, Penalties(Legal), Adjudication procedure, Local governments, Lake

*Information(Prosecution), *Navigation obstructions, Hazardous stances(Pollution).

An information was filed against a manufacturer and a municipal corporation for violations of Section 407 and 411 of the Rivers and Harbors Act. The Act makes it a misdemeanor to deposit'... any refuse matter of any kind or description whatever other than that flowing from streets and sewers and passing therefrom in a liquid state, into any navigable water....' The defendant discharged liquid phenolic resin from its manufacturing plant, through the sanitary district's sewer system and into Lake Michigan. The court held that the liquid phenolic resin came within the statutory prohibi-tion, but reversed the convictions on grounds that uon, our reverse the convictions on grounds that the activity complained of came within the specific statutory exclusion of any refuse matter 'flowing from streets and sewers and passing therefrom in a liquid state.' (Fernandez-Florida) W75-12283

TRAIN V. CITY OF NEW YORK (CLASS ACTION BY CITY TO COMPEL EPA TO ALLOT FUNDS AUTHORIZED BY THE 1972 FEDERAL WATER POLLUTION CONTROL ACT AMEND-MENTS).

95 S. Ct. 839-847 (1975).

Descriptors: *Judicial decisions, *Administrative Administrative agencies, *Allotments, *Treatment facilities, *Cities, Waste treatment, Grants, Water pollution, Water treatment, Treatment, Administration, water treatment, Treatment, Administration, Federal government, Cost sharing, Legal aspects, Legislation, Economics, Government finance, Financing, Water Quality Act, Federal Water Pol-lution Control Act, New York. Identifiers: *Federal Water Pollution Control Act

Amendments of 1972, *Injunctive relief, Hazardous substances(Pollution), Environmental policy, Class action suits.

A class action was brought by the City of New York against the Administrator of the Environmental Protection Agency (EPA) to compel allotment of funds which were appropriated under the authority of the 1972 Amendments of the Federal Water Pollution Control Act. Title II of these Amendments makes available federal financial assistance for municipal sewers and sewage treatment works. Section 207 authorizes the appropriation of 'not to exceed,' specified amounts for each tion of 'not to exceed' specified amounts for each of three fiscal years, and section 205(a) provides that the 'sums authorized to be appropriated pur suant to section 207... shall be alloted by the Ad-ministrator' of the Environmental Protection Agency. In compliance with a Presidential Directive, the Administrator refused to allot the maximum allowable amounts. The issue was whether the 1972 Act permits the Administrator to allot to the States under section 205 less than the entire amounts authorized to be appropriated by section 207. The Supreme Court held that the Act required the allotment of all sums authorized to be appropriated, and that the administrator was not authorized to allot lesser sums in his discretion. (Fernandez-Florida) W75-12284

TRAIN V. CAMPAIGN CLEAN WATER, INC. (ACTION BY ENVIRONMENTAL GROUP TO REQUIRE EPA TO RELEASE FUNDS AUTHORIZED FOR FEDERAL GRANTS TO MUNICIPALITIES FOR WATER POLLUTION 95 S. Ct. 847-848 (2975).

Descriptors: *Judicial decisions, *Administrative agencies, *Grants, *Treatment facilities, *Cities, Waste treatment, Water pollution, Water treatment, Treatment, Administration, Federal government, Treatment, Treatment,

ment, State government, Cost sharing, Legal aspects, Legislation, Economics, Government finance, Financing, Water Quality Act, Federal Water Pollution Control Act, Altorments, Identifiers: *Federal Water Pollution Control Act Absendments et al. 1922

Amendments of 1972, *Hazardous sub-stances(Pollution), *Injunctive relief, Administrative regulations, Environmental policy.

An environmental group brought an action against the Administrator of the Environmental Protection Agency challenging the Administrator's action in withholding from the states 55 per cent of a fund authorized by Congress under the Federal Water Pollution Control Act (FWPCA), for federal grants to municipalities for construction of publicly-owned waste treatment works. The Supreme Court held that the Administrator did not have dis-cretion to allot to the states less than all sums authorized to be appropriated under the FWPCA Amendments of 1972. (Fernandez-Florida)

WETZEL V. A. DUDA AND SONS (ACTION BY RIPARIAN PROPERTY OWNERS TO ENJOIN WATER POLLUTION TO LAKE FROM FARM-ING OPERATIONS)

306 So. 2d 533-534 (4th D.C.A. Fla. 1975).

Descriptors: *Trespass, *Judicial decisions, *Water pollution, *Lakes, *Farm wastes, Common law, Legal aspects, Riparian rights, Equity, Land tenure, Water law, Water pollution sources, Florida, Riparian land, Wastes, Farms, Chemical wastes, Agricultural chemicals, Chemicals. Identifiers: *Injunctive relief, *Intentional torts, *Nuisance(Legal aspects), Hazardous substances(Pollution), Non-point sources(Pollution).

Plaintiffs, riparian property owners on a lake, brought an action against a nearby farming operation for an injunction to abate water pollution and for damages. Defendants were polluting the lake by discharging noxious chemical and other substances from a nearby farming operation. Plain stances from a nearby farming operation. Plain-tiffs alleged that their riparian rights were injured by the defendant's creation of a nuisance, that defendents breached their duty to conduct their farming operation in such a manner as not to injure rarming operation in such a manner as not to injure plaintiffs, that the defendants were engaging in a continuing trespass, and that the actions of the de-fendants were willful and malicious. The trail court dismissed the action for failure to exhaust their administrative remedies under the Environmental Protection Act. The Fourth District Court of Appeal of Florida reversed and remanded hold-

musance, continuing trespass, and continuing breach of duty; therefore, the property owners were not required to exhaust administrative remedies before seeking injunctive relief. (Fernandez-Florida) W75-12286

ing that the action was predicated on the right to

COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. V. TRAIN (CITIZEN SUIT TO COMPEL THE ENVIRONMENTAL PROTECTION AGENCY TO CONTROL DISCHARGE OR RADIOACTIVE MATERIALS INTO NAVIGABLE WATERS).

507 F. 2d 743-749 (10th Cir. 1974).

Descriptors: *Radioactive wastes, *Colorado, *Water pollution control, *Federal Water Pollution Control Act, Regulation, Permits, Water pollution sources, Pollutant identification, Impaired water quality, Federal project policy, Federal jurisdiction, Administrative agencies, Navigable

Identifiers: *Administrative accountability.

Plaintiff, a nonprofit Colorado Corporation, sought to compel the Administrator of the United States Environmental Protection Agency to con-trol discharges of radioactive materials into navigable waters. The Administrator claimed that by-products were not radioactive pollutants under law, and refused to regulate discharges into Colorado waters. Relying on the principle that a clear and reasonably certain statute requires no additional rule of construction, and noting that the Federal Water Pollution Control Act requires the Administrator to control pollutants, including radioactive materials, the United States Court of Appeals, Tenth Circuit, reversed and remanded the summary judgment in favor of defendants rendered by the District Court. (Knocke-Florida)

SUBMERGED LANDS (STATE TITLE TO CERTAIN SUBMERGED LANDS).
Illinois Stat. Ann. Ch 19, secs. 150 thru 151 (Smith-

Hurd 1972) 1 n

Descriptors: *Illinois, *Land reclamation, *Ownership of beds, *Beds under water, *Penalties(Legal), Regulation, Legislation, Public

Identifiers: *Submerged lands, *Reclaimed land.

Under sections 150 and 151 the State of Illinois asserts the right to reclaim tille to land in the state now submerged, and land that was formerly submerged, but which has since been illegally filled in, reclaimed and occupied. To enforce the State's claim, the Attorney General is authorized to bring suit to recover the lands, or to protect such lands from illegal occupation. (Hoffman-Florida) W75-12288 Under sections 150 and 151 the State of Illinois as-

BORGMANN V. FLORISSANT DEVELOPMENT CO (ACTION TO ENJOIN ADJOINING PRO-PERTY OWNERS FROM COLLECTING AND DISCHARGING SURFACE WATER PLAINTIFFS' LAND). 515 S. W. 2d 189-197 (Mo. Ct, App. 1974). WATER ONTO

Descriptors: "Riparian land, "Riparian rights,
"Natural flow doctrine, "Adjacent landowners,
"Judicial decisions, Legal aspects, Common law,
Equity, Land tenure, Negligence, Water law,
Water rights, Relative rights, Competing uses,
Water transfer, Natural flow, Channel flow, Flow,
Streamflow, Regulated flow, Alteration of flow,
Diversion, Obstruction to flow.
Identifiers: "Common enemy rule, "Injunctive relief, Nuisance/Legal aspects).

lief, Nuisance(Legal aspects).

Plaintiff, landowners sued to enjoin adjoining pro-perty owners from collecting and discharging sur-face water onto plaintiffs' land. The issue presented was whether a landowner may develop a tract of land by building an apartment complex and collect surface water into a weir located on his property and permit the overflow to be discharged onto the adjoining tract of land. Plaintiffs con-tended that defendants constructed the system of storm sewers in a manner changing the flow of surstorm sewers in a manner changing the flow of sur-face waters from the natural water course' and have discharge large quantities of surface water onto plaintiffs' lands where no natural water-course existed prior to the construction. The court held that if the conformation of the land gives to held that if the conformation of the land gives to
the surface water flowing from one tract to the
other a fixed and determining course, so as to
uniformly discharge it upon the servient tract at a
fixed and definite point, the course thus uniformly
followed by the water in its flow is a
'watercourse'. In denying the injunction, the court
further held that defendant's discharge of water
onto plaintiffs' land was through a 'natural surface
water drainway or channel' and thus permissible
under the common enemy doctrine. (Fernandez-Florida) W75-12289

GUMZ V. BEJES (ACTION BY ADJOINING LANDOWNERS FOR INJUNCTION AGAINST FLOODING FROM DRAINAGE AND IRRIGA-TION DITCH). 321 N.E 2d 851-858 (Ct. App. Ill. 3d Dist. 1975).

Descriptors: *Flooding, *Adjacent land owners, *Flood routing, *Watercourses(Legal aspects), Floods, Abatement, Check structures, Dams, Dikes, Drainage systems, Flood damage, Overflow, Flow control, Pumps, Water circulation, Artificial watercourses, Developed waters.

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Plaintiffs, adjoining landowners to defendant, sought an injunction and damages for causing their sought an injunction and damages for cassing their land to flood. Defandant counterclaimed for injunctive relief and damages for plaintiffs alleged obstruction to water flow. A flood control gate was erected and maintained by all parties since at least 1956. After erecting a private system of dikes on his own land, defendant demanded contribution from plaintiffs for keeping their lands from flooding. When no money was paid, defendant modified ing. When no money was paid, defendant modified his dikes to protect his own lands which caused flooding on plaintiff's land. Judgment was for plaintiff. The Third District Court of Appeals of Indiana affirmed on the grounds that water which has become part of a watercourse may not be diverted by an owner onto his neighbor's land without liability. (Knocke-FLorida) W75.1290 W75-12290

GULF SHORE SEAFOOD AND COMPANY V. CTIES SERVICE CO. (ACTION FOR DAMAGES ARISING FROM DAM BREAK OF PHOSPHATE COMPANY'S DAM PERMITTING PHOSPHATE SLIME POLLUTION OF RIVER). 501 F.2d 957 (5th Cir 1974).

Descriptors: *Floods, *Phosphates, *Adjacent land owners, *Flood damage, Flood control, Flood protection, Watercourses(Legal aspects), Rivers, Banks, Dams, Dam failure.

Plaintiff brought a diversity action in tort against defendant phosphate company for compensatory and punitive damages resulting from a dam break causing phosphate slime to pollute the Peace River next to plaintiff's land. While plaintiff graphically depicted the extent of pollution damage, he failed to adduce substantial evidence of willful and wanterstreaments. to adduce substantial evidence of wintin and wan-ton misconduct by defendant which would support punitive damages. The United States District Court directed a verdict denying punitive damages and awarding compensatory damages. The fifth Circuit Court of Appeals affirmed. (Knocke-Porida) W75-12291

WILDWOOD ESTATES OF BRAINTREE, INC. V. SMITH (ACTION TO DETERMINE PRESCRIPTIVE RIGHTS OF USE IN DEFEN-DANT'S POND). 322 N.E. 2d 781 (Mass App 1975).

Descriptors: *Adjacent land owners, *Ponds, *Prescriptive rights, Legal aspects, Equity, Water rights, Judicial decisions.

Plaintiffs sought rights of precription in defendant's pond. Because of a failure by plaintiffs to use the pond uninterruptedly for over 20 years, the Appeals Court of Norfolk County, Massachusetts affirmed the trial court's judgment for defendant. (Knocke-Elorida) (Knocke-Florida) W75-12292

VALIDITY, UNDER FEDERAL CONSTITU-TION, OF STATE STATUTE OR LOCAL OR-DINANCE REGULATING PHOSPHATE CON-TENT OF DETERGENTS, P. H. Myers. 21 ALR Fed. 365-375 (1974). 11 p, 6 ref.

Descriptors: *Local governments, *Phosphates, *Water pollution sources, *Constitutional law, *Judicial decisions, Water quality control, Eutrophication, Florida, Illinois, Chicago, Industries, Environmental control, Legislation. Identifiers: State policy, Hazardous substances(Pollution), Phosphate, Regulation, Com-

merce clause, Chicago ordinance, Ordinances, Statutes.

The annotation deals with constitutional chal-lenges to state and local statutes regulating the phosphate content of detergents. Most of the litigation involves suits by the Soap and Detergent Association for a preliminary injunction against enforcement of a statute. The courts are divided on the issue of whether the statute or ordinance constitutes an undue burden on commerce. Emconstitutes an undue burden on commerce. Employing a balancing test, more courts have upheld such laws where the only burden on interstate commerce is increased cost to the businessman. A Chicago ordinance making it a criminal offense to sell detergent containing phosphates was held to constitute an undue burden on commerce because the product was not sufficiently harmful to justify disruption of the flow of interstate commerce. Challenges based on substantive due process and equal protection grounds have not succeeded thus far in the federal district courts. (Jenkins-Florida) W75-12293

UNITED STATES V. ASHLAND OIL AND TRANSPORTATION CO. (APPEAL FROM FINDING THAT DEFENDANT HAD VIOLATED FWPCA AMENDMENTS OF 1972 BY DISCHARGING OIL INTO NAVIGABLE STREAM). 504 F.2d 1317-1330 (6th Cir. 1974).

Descriptors: *Federal Water Pollution Control Act, *Water pollution, *Water pollution control, *Water pollution sources, *Oil pollution, *Oil spills, Water, Water quality, Water quality control, Pollutants, Pollutant identification, Oil, Streams, Navigable waters, Tributaries, Rivers, Navigable rivers.

Identifiers: Evidence, Hazardous sub-

stances(Pollution).

Corporate defendant was charged under the Federal Water Pollution Control Act of 1972 with Federal Water Pollution Control Act of 1972 with failing to immediately notify an appropriate federal agency after ascertaining that it had discharged oil into a non-navigable stream. The United States District Court for the Western District of Kentucky entered a guilty verdict from which defendants appealed. The Sixth Circuit affirmed and held that the Act was intended to control both discharges of pollutants directly into navigable waters and discharges of pollutants into non-navigable tributaries which flow into navigable waters. The court also found that Congress has the constitutional authority under its interstate commerce powers to prohibit the discharge of pollutants into non-navigable tributaries of navigable streams. The court noted that the government is nutants into non-navigable tributaries of navigable streams. The court noted that the government is not required to bear the burden of proof to establish that pollutants were not only discharged into a non-navigable tributary of a navigable river, but also that reached and polluted the navigable river. (Gagliardi-Florida)
W75-12294

AQUATIC WEED CONTROL - STATE REVENUE LAWS. Fla. Stat. sec. 213.11 (1971), as amended, act 217, sec. 1 (1973) Fla. Laws.

Descriptors: *Florida, *Aquatic weed control, *Aquatic weeds, *Taxes, *Water hyacinth, Cultural control, Watershed management, Antifouling materials, Aquatic algae, Legislation, Aquatic life. Aquatic plants.
Identifiers: *Aquatic vegetation.

Under this statute, two percent of all revenues col-lected under the first gasoline tax will be trans-fered from the Department of Revenue to the agency in charge of controlling aquatic weeds. This revenue, limited to two million eight hundred thousand dollars, will be used only for the eradica-tion, control, and research of water hyacinths and noxious aquatic vegetation. (Hoffman-Florida) W75-12295

TARSHIS V. LAHAINA INVESTMENT CORP. (RESPONSIBILITY OF OWNER OF BEACH FRONT PROPERTY TO WARN OF SURGING WAVE). 400 F.2d 1019-1021 (9th Cir. 1973).

Descriptors: *Judicial decisions, *Hawaii, *Waves, *Turbulence, *Surf, *Negligence, Ocean waves, Rip currents, Third party effects, Local aspects, Penalties(Legal).
Identifiers: *Tort liability, *Beach front hotels.

Plaintiff brought a tort action against an oceanfront hotel for personal injuries suffered as a result of being thrown on the beach by a wave. The plaintiff alleged negligence by the hotel in not warning its guests of the existence of the powerwarning its guests of the existence of the power-ful, surging surf. An appeal was taken following a summary judgment of dismissal. In reversing the trial court, the Court of Appeals found that whether the ocean would have appeared dan-gerous to an ordinarily intelligent person was question of fact inappropriate for summary adjudi-cation. The case was remanded to allow the plaintiff to present her theory that the surf represented an unapparent, dangerous condition of which the hotel operator negligently failed to warn its guests. (Hoffman-Florida) W75-12296

WATER SUPPLY. New York Session Laws, Ch. 664, sec. 15-1501 through 1529 (McKinnley 1972).

Descriptors: *Well regulations, *New York, *Reservoirs, *Reservoir construction, *Reservoir *Reservoirs, *Reservoir construction, *Reservoir sites, *Water supply, *Dependable supply, Reservoir operation, Water management, Water utilization, Legislation, Pipelines. Identifiers: *Forest preserve reservoirs, *Water supply construction, *Legal damages.

The statute contains regulations concerning the in-stallation of new sources of water supply. All maps and plans for new or additional sources of water supply or for public forest preserve reser-voir projects are to be submitted for approval to voir projects are to be submitted for approval to the appropriate state department. The information required on the application is set forth in detail. Restrictions are placed on the transportation of freshwater from New York to neighboring states. Guidelines for the approval of reservoir projects are set forth. Also designated is supervision of construction, responsibility for future repairs, and holder of title to the reservoir. The statute also establishes requirements for obtaining permission to drill wells in Long Island, and provides for the nayment of damages to any third person injured by payment of damages to any third person injured by the execution of any water supply project carried on by the City of Rochester. (Hoffman-Florida) W75-12297

CITY OF LAKE CHARLES; RECLAMATION AND DEVELOPMENT OF LAKE FRONT. Louisiana Constitution, Article 14, sec. 39 (Supp.

Descriptors: *Louisiana, *Land reclamation, *Land development, *Land management, *Levees, Public lands, Legislation, Land tenure, Economics, Breakwaters, Retaining walls, Eminent domain, Cities, Local governments, State governments.

Identifiers: *Lakefront development, *Beach

The Louisiana Constitution authorizes the City of Lake Charles to have full and exclusive right and Lake Charles to have full and exclusive right and power to provide various works, of a non-commercial non-profit nature, necessary for the reclamation and development of the lake front. The section describes the particular area of Lake Charles and the adjoining property over which the City will have control. The City of Lake Charles is also authorized to acquire any private property along the shore of the lake, within the defined

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limits necessary for the reclamation project. To help defray costs, the State grants title to the city of all public property necessary to further the goals of the project. The State is prohibited from authorizing any governmental subdivision, private entity or person to reclaim the bed of the lake or constructing any works within the limits described. Finally, the City of Lake Charles is authorized to issue bonds and incur additional debt of up to \$3 million to finance the public improvements authorized. (Hoffman-Florida) W75-12298

UNITED STATES V. 187.40 ACRES OF LAND, HUNTINGDON COUNTY, PA. (ACTION TO CONDEMN LAND FOR USE IN CONSTRUCTING FLOOD CONTROL PROJECT).
381 F. Supp. 54 (M.D. Pa. 1974).

Descriptors: *Condemnation, *Flood control, *Reservoir construction, Pennsylvania, Rivers, Flood protection, Condemnation value, Flooding, Floods, Reservoir sites, Reservoirs, Eminent domain.

Identifiers: Presumptions(Legal).

This case arises from condemnation proceedings instituted by the Secretary of the Army for the construction of a flood control reservoir on the Juniata River, Huntingdon County, Pennsylvania. The United States moved to strike the landowners' defense that the Secretary of the Army lacked statutory authority to take the land and that their land was not necessary to the success of the project. The United States District Court for the Middle District of Pennsylvania held that the Secretary had authority to take the property even though the property was not listed in the plan submitted to Congress. The court found that the judicial role in reviewing condemnation cases does not encompass the power to determine whether the land taken is actually necessary for the successful operation of the project, but only extends to deciding the propriety of the public purpose of such acquisitions and the requisite statutory authority. (Gagliardi-Florida)

WATER CONSERVATION IN SWEDEN: II. POLLUTION CONTROL,

National Swedish Environment Protection Board, Stockholm.

For primary bibliographic entry see Field 5G. W75-12317

ENVIRONMENTAL WATER QUALITY PRO-

GRAM, Chicago Dept. of Aviation, Ill. For primary bibliographic entry see Field 5G. W75-12331

LIAISON WITH PLANNING AUTHORITIES-A VITAL LINK, P. Satchell

Water, No 3, p 9-11, April, 1975. 1 fig.

Descriptors: *Water policy, *Water supply, *Legislation, *Administration, Comprehensive planning, Decision making. Identifiers: Water authorities, Great Britain.

The need for cooperation between water authorities and local planning agencies is essential to providing proper water services. This need was recognized by Section 24(8) of the Water Act 1973 making it necessary for water authorities to take development plans, local plans, and structure plans into account and consult with local authorities. The Severn Trent Water Authority arranges a meeting about once a year with the county officials, regional economic planning councils, managers of new towns, and the central and regional Department of Environment. Planning applications are part of the on-going responsibilities

of the water authority which are passed on to the proper division to get their opinions on the appropriate water reclamation and supply. The water authority must keep the counties and districts informed of the intent and content of their short and medium term programs. Although the water authority should contribute to the planning process it is not their purpose to usurp the function of local planners. (Dean-FIRL.)

NORTH WEST: A DIRTY INHERITANCE. For primary bibliographic entry see Field 5G. W75-12336

HISTORICAL AND LEGAL ASPECTS OF NEPA, For primary bibliographic entry see Field 6G. W75-1237

HOW WELL ARE WE HANDLING TOXIC WASTE.

For primary bibliographic entry see Field 5E. W75-12342

CANADIAN DRINKING WATER SURVEIL-LANCE PROGRAMS, PANEL DISCUSSION, Nova Scotia Dept. of Public Health, Halifax. Div. of Public Health Engineering. For primary bibliographic entry see Field 5G. W75-12355

6F. Nonstructural Alternatives

FLOOD INSURANCE AND FLOOD PLAIN ZON-ING AS COMPATIBLE COMPONENTS, Clark Univ., Worcester, Mass. Dept. of Geog-

A. L. Marcus, and G. H. Abrams. Natural Resources Lawyer, Vol 7, No 4, p 481-619 (1974). 29 p, 112 ref, 4 fig.

Descriptors: *Flood plain insurance, *Flood plain zoning, *Flood damage, *Flood protection, *Flood plains, Nonstructural alternatives, Legal aspects, Water zoning, Zoning, Flood routing, Economics, Insurance, Floodways, Overflow, Flood control, Floods, Flood data, Flood flow, Flood forecasting, Flash floods, Multiple-purpose projects, Alternative planning.

Identifiers: *Flood damage reduction, Compatible

component approach.

An examination is made of the utilization of flood insurance as an element in a multiple alternative planning objective for flood plain regulation. Physical, human, and legal aspects of the problem are explained in relation to decision-making policies. Initially, the article describes the physical setting which leads to the occurrence of floods. An explanation of the interplay between river hydrology and numerous meteorological stimuli is presented. Further, the authors consider human encroachment on flood plains as one of the primary causes of flood losses. Two factors are emphasized as significantly contributing to flooding: large developed areas which have caused an increase in initial runoff, and the rise in elevation of flood waters as a result of man-made obstruc tions. The article presents the ramifications of flood insurance in great detail, describing its benefits in effecting a comprehensive flood protection program. Constitutional issues of due process, equal protection, and taking of property without compensation are discussed. The authors conclude that flood insurace is a viable component for a program to help relieve flood-induced tragedy. (Fernandez-Florida) W75-12227 FLOOD PLAIN INFORMATION: ELLICOTT CREEK IN THE TOWNS OF LANCASTER AND ALDEN AND THE VILLAGE OF ALDEN, ERIE COUNTY, NEW YORK. Army Engineer District, Buffalo, N.Y.

Prepared for New York State Department of Environmental Conservation, Division of Water Resources, October, 1972. 56 p, 24 fig, 9 plates, 10 tab.

Descriptors: *Floods, *Flooding, *Flood plains, *Flood protection, *Flood damage, *Flood plain zoning, Maximum probable flood, Obstructions to flow, *New York.

Identifiers: Lancaster(NY), Alden(NY), Eric County(NY), *Ellicott Creek(NY), Intermediate Regional Flood(IRF), Standard Project Flood(SF).

The reach of Ellicott Creek covered in this report lies within the Town of Lancaster and the Town and Village of Alden, New York, a total length of 13.8 miles. Flood records are incomplete but research showed the greatest flood was in 1936 (estimated 50-year frequency). Other major floods occurred in 1916, 1929, 1937, 1959 and 1963. Melting snow coincident with moderate amounts of precipitation has often caused major damaging floods in late winter or early spring although large floods occur at all times of the year. Development in the flood plain has been substantial and will continue to increase due to increased suburbanization in the Buffalo area; population in the basin has in-creased from 19,000 in 1920 to 153,000 in 1970. Floods of any major proportion could cause sub-stantial damage due to residential and commercial stantial damage due to residential and commercial development in the flood plain, high channel velocities, and obstructions in the channel of vegetation. The Alden sewage disposal plant would be damaged, creating health problems. At stoney Road Bridge an Intermediate Regional Flood would have a peak discharge of 6,350 cfs and the Standard Project Flood discharge would be 23,800 cfs. No specific regulations for land use with respect to flood risk are in effect in these towns. Channel improvements, levees and a reservoir are included in possible flood control measures under consideration. Suggestions for flood plain management include encroachment lines, zoning, subdivision regulations, building codes, and flood plain regulations. (Park-North Carolina) W75-12365

FLOOD PLAIN INFORMATION: MOORES CREEK, ALBEMARLE COUNTY AND CHAR-LOTTESVILLE, VIRGINIA. Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 4A. W75-12366

FLOOD PLAIN INFORMATION--COASTAL FLOODING: TOWN OF POQUOSON, VIR-GINIA. Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 4A. W75-12367

FLOOD PLAIN INFORMATION: MEHERRIN RIVER, EMPORIA, VIRGINIA. Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 4A. W75-12368

FLOOD PLAIN INFORMATION, WIL-LAMETTE RIVER, JOHNSON, KELLOGG AND MT. SCOTT CREEKS, MILWAUKIE-OAK GROVE-LAKE OSWEGO, OREGON. Army Engineer District, Portland, Oreg. For primary bibliographic entry see Field 4A. W75-12369

Ecologic Impact Of Water Development—Group 6G

FLOOD PLAIN INFORMATION: SPRING AND WILLOW CREEKS, HOU METROPOLITAN AREA, TEXAS. Army Engineer District, Galveston, Tex. For primary bibliographic entry see Field 4. HOUSTON

FLOOD PLAIN INFORMATION: ONION CREEK, AUSTIN, TEXAS.
Turner, Collie and Braden, Inc., Houston, Tex.; and Army Engineer District, Galveston, Tex. For primary bibliographic entry see Field 4A.
W75-12374

FLOOD PLAIN INFORMATION: JAMES RIVER, HOWARDSVILLE TO SCOTTSVILLE, ALBEMARLE COUNTY, VIRGINIA. Army Engineer District, Norfolk, Va. rimary bibliographic entry see Field 4A. For primary W75-12375

FLOOD PLAIN INFORMATION: SOUTH SAN-TIAM RIVER, LEBANON, OREGON. Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 4A.
W75-12376

SPECIAL FLOOD HAZARD INFORMATION: ISSAQUAH AND TIBBETTS CREEKS, ISSAQUAH AND VICINITY, WASHINGTON. Army Engineer District, Seattle Wash. For primary bibliographic entry see Field 4A. W75-12377

SPECIAL FLOOD HAZARD INFORMATION: PARADISE CREEK, PULLMAN AND VICINI-TY, WASHINGTON. Army Engineer District, Walla Walla, Wash. For primary bibliographic entry see Field 4A. W75-12378

FLOOD PLAIN INFORMATION: HACKBERRY CREEK AND COTTONWOOD BRANCH, DAL-LAS COUNTY, TEXAS.

Army Engineer District, Fort Worth, Tex. For primar W75-12379 primary bibliographic entry see Field 4A.

6G. Ecologic Impact Of Water Development

SEATTLE PROJECT CALLS FOR ROCK WEIRS. For primary bibliographic entry see Field 4A. W75-11922

BEHAVIOURAL RESPONSES OF WHITEFISH AND RAINBOW TROUT TO DRILLING FLUIDS, and Marine Service. Winnipeg For primary bibliographic entry see Field 5C. W75-11952 (Manitoba)

INPUT-OUTPUT ANALYSIS AND THE EN-VIRONMENT, University Coll. of Wales, Aberystwyth. Dept. of P. N. Mathur.

Southampton University, Department of Economics, Environmental Economics Study Group Bibliography Series 14, 1973. 6 p, 18 ref.

Descriptors: *Economic impact, *Bibliographies, *Input-output analysis, *Mathematical models, *Pollution abatement, Social impact, Industrial production, Leontief models. Identifiers: *Isgard models.

Input-output analysis, as a tool for the study of pollution abatement, is presented with an introduction to its mathematics and an annotated bibliography. The mathematics of input-output analysis can be described in terms of (1) a partianalysis can be described in terms of (17 a parti-tioned matrix with component matrices of coeffi-cients of input-output, pollution generation, goods required for eliminating pollutants, and pollution production and of total factor costs of both economic activities and pollution control activi-ties; and (2) output, cost, and price vectors. In-cluded in the bibliography are the 3 books and 15 articles published from 1966 to 1974. The topics range from a simple introduction to a summary of previous theoretical work to an application of input-output analysis to Canadian industry. Empirical results as well as theoretical results are presented in the articles covering the effect of pol-lution control in U.K. prices, the Leontief models, the Isgard model, and other applications of input-out analysis. (Becker-Wisconsin) W75-12177

INTERNATIONAL ECONOMICS AND EN-VIRONMENT CONTROL,
Univ. (England). Dept. Feonomics.

Environmental Economics Study Group Bibliography Series 11, December 1973. 7 p., 38 ref.

*Pollution Descriptors: abatement. *Bibliographies, *Environmental control. Industrial production, Economic impact, Foreign rade, Standards, Political aspects, Competition, Social aspects.

Identifiers: *Externalities, *Spillover effects, *International economics, International cooperation, International boundaries.

This bibliography contains 38 references to books and journal articles pertaining to the area of international economics and environmental control. It includes the topics of trade and environmental quality, economic development and environmental quality, pollution control and international trade, and international transmission of pollution. Of the 38 references, 9 were contributed by I. Walter and 5 by R.C. d'Arge. The bibliography covers articles published in the period from September 1970-September 1973. (Becker-Wisconsin)

ECONOMIC GROWTH VS. THE ENVIRON-MENT. A BIBLIOGRAPHY,

Bristol Univ. (England). Dept. of Economics. R. Lecomber.

Southampton University, Department of Economics, Environmental Economics Study Group Bibliography Series 6, August 1973. 13 p,

Descriptors: *Environmental effects, *Industrial production, *Bibliographies, *Optimization, *Decision making, Natural resources, Welfare(Economics), Foreign countries, Model studies, Measurement, Discount rates, Ecology, Political aspects, Forecasting, Ethics, Planning, Social values, Social aspects, Foreign trade, Human population, Water pollution, Legal aspects, Psychological aspects, Legislation, Pollution abatement. aspects, rsy-tion abatement. *Externalities, *Uncertainty,

Welfare distribution.

This bibliography includes 159 references to a wide range of topics. To facilitate use of the bibliography, an index with sections encompassing various areas and controversies associated with economic growth and the environment is included. Index headings are: general surveys, models, etc.,
(1) growth and externalities, (2) irrationality,
ignorance and failure in the assumption of exogenous tastes; (3) future generations; (4) welfare distribution; (5) growth and environment in an in-ternational setting; (6) developing countries; (7) the role of uncertainty; (8) growth and other sources of environmental deteriorations; (9) prophesies of doom; (10) technicalities of measuring growth, welfare, etc., (11) discussion of discount rate; (12) multi-period optimization models; (13) policies for the environment; (14) a short reading list. All articles are listed under at least one index subheading. (Becker-Wisconsin) W75-12182

BIG CYPRESS NATIONAL PRESERVE (PART

Hearings--Subcomm. on Parks and Recreation-Comm. on Interior and Insular Affairs, U. S. Senate, 93d Cong, 2d Sess, March 21 and 22, 1974. 369 p, 1 map, multiple photo, multiple illus.

Descriptors: *Florida, *Swamps, Parks, Recreation, Ecology, Water, Ecosystems, Land, Slopes, Sheet flow, Water levels, Rainfall, Watershed management, Drainage, Drainage effects, Drainage patterns (Geologic).

Identifiers: Congressional hearings.

The Senate Subcommittee on Parks and Recreation convened on March 21, 1974 to consider S.334, S.783, S.920 and H. R. 10088. All four measures involve protection for the Everglades-Big Cypress ecology. The bills differ in the methods of acquisition and slightly different acreage in the acquisition and establishment plans. A vital factor in the Big Cypress ecosystem is the slope of the land, which results in exceedingly slow drainage which extends the wet months beyond the period of actual rainfall. The underneath flatness causes sheet flows, the result of which is water level changes of only a few inches which can affect thousands of acres. Much of those acres stand under water for as long as four months after the rainfall ceases. This is a natural watershed storage area and supplements the manmade areas. Although acquisition will be expensive, a monumental commitment in terms of funds for environment protection may be necessary since future action will probably be even more expensive.
(Gagliardi-Florida)
W75-12195

For primary bibliographic entry see Field 5G. W75-12201

THE FIFTH ANNUAL REPORT OF THE COUN-CIL ON ENVIRONMENTAL QUALITY.
Council on Environmental Quality, Washington,

For sale by the Superintendent of Documents, Government Printing Office, Washington, DC, for \$5.20. 1974, 636 p, 57 fig, 1 illus, 76 photo, 86 tab, 12 append.

*Administrative Descriptors: Descriptors: *Administrative agencies, *Environmental control, *Environmental engineering, Air pollution, Water pollution, Land use, Land development, Land management, Land resources, Programs, Administration, Federal Government, Regulation, Comprehensive planning, Legal aspects, Planning,

Social aspects, Water resources development, Statistics, Legislation, United Nations. Identifiers: *Environmental policy, *National Environmental Policy Act, Energy crisis, Hazardous substances (Pollution), Non-print sources (Pollution) (Pollution).

This Fifth Annual Report of the Council on Environmental Quality was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), which requires the Council to report at least once a year on the state of the environment an east once a year on the state of the environment and efforts to improve it. An overview of current knowledge about a number of land use issues is presented. Topics include: the environmental, economic, and social impacts of land development; the various stimulants which affect development.

Field 6-WATER RESOURCES PLANNING

Group 6G—Ecologic Impact Of Water Development

ment; and the different tools available to control the pace and character of development. Major developments during the past year in government programs to protect the environment are considered. Information about the condition of the enviroment, important trends in environmental quality, and basic environmental statistical data is provided in the Report. One chapter reviews the evolution of the National Environmental Policy Act over its first five years, including the adoption of environmental impact statement requirements by the states and foreign countries. The report describes the development of the United Nations Environmental Program, and, in the framework of its Action Plan, the broad range of international environmental efforts now underway around the globe. The final chapter provides brief descriptions of some of the Council's analytical work over the past year. (Fernandez-Florida) W75-12203

USES OF SCIENTIFIC INFORMATION IN EN-VIRONMENTAL DECISION-MAKING, Indiana Univ., Bloomington, School of Law. M. R. Gelpe, and A. D. Tarlock.
Southern California Law Review, Vol 48, No 2, p 371-427, 1974. 57 p, 145 ref.

Descriptors: *Legal aspects, *Public rights, *Water law, *Competing uses, *Cost-benefit analysis, Costs, Economics, Benefits, Environmental effects, Common law, Constitutional law, Equity, Judicial decisions, Regulation, Third party effects, Social aspects, Water rights, *Adjudication procedure, Legislation, Public health, Environment, Cost-benefit theory, Technology, Natural resources, Risks.

*Proximate Identifiers: *Environmental policy, *Hazardous substances (Pollution), Injuctive relief, Standing(Legal).

The response of the legal system to the uncertainty inherent in scientific analysis of environmental impacts is explored. The authors argue that existing concepts of cause-in-fact, the foundation of legal liability, place potentially severe constraints on the ability of the legal system to respond to the need to minimize the risks of future environmental injury. Both the legal and scientific concepts of cause are explained and distinguished. The article points out the concern of science to describe physical relationships and draw inferences from observed to unobserved behavior, while the law treats an event as having happened or likely to occur regardless of what did in fact happen or may occur. In addition, the article discusses the less of what did in fact happen or may occur. In addition, the article discusses the decision-making process with respect to how much of an activity should be with respect to now much of an activity should be allowed or if a project should be prohibited or modified as one aspect of the broader problem of technology assessment. The relationship between the problems studied by the science of ecology and the difficult problems of value choice faced by decisionmakers forced to choose between alternative uses of natural resources is explored. In con-clusion, the article proposes a refinement of the concepts of cause and injury, to conform them to real threats to the environment, by means of riskbenefit analysis consistent with principles of fair-ness. (Fernandez-Florida) W75-12204

THE DOCTRINE OF PRIMARY JURISDICTION MISCONCEIVED: END TO COMMON LAW EN-VIRONMENTAL PROTECTION, Florida Attorney General's Office, Tallahassee.

K. F. Hoffman. Florida State University Law Review, Vol 2, No 3, p 491-510, 1974, 20 p, 110 ref.

Descriptors: *Administrative Descriptors: "Administrative agencies, "Administrative decisions, "Jurisdiction, "Judicial decisions, "Pollution abatement, Common law, Equity, Public health, Public rights, State govern-ments, Administration, Water law, Legal aspects, Adjudication procedure, Administration, Federal Legal review, Water pollution, government, Abatement, Control, Water pollution control, Water pollution sources.

Identifiers: *Hazardous substances (Pollution), *Injunctive relief, *Nuisance (Legal aspects).

The doctrine of 'primary jurisdiction' was articulated by the United States Supreme Court in 1907. The doctrine bars access to the courts where a dispute should be heard first in an administrative tribunal, for purposes of uniformity or to make use of particular administrative expertise. This article examines the effect of the primary jurisdiction doctrine on common law actions to abate pollution-caused nuisances. Both the history and limitations of the doctrine are reviewed. Historically, government possessed the authority and duty to seek abatement of nuisances that threatened public health and welfare; and courts of equity have had concurrent jurisdiction. This article illustrates how the doctrine of primary jurisdiction destroys that traditional authority and replaces it with administrative control. Most commentators agree, states the author, that these agencies are very unsatisfactory substitutes because they are unresponsibe to public needs. The article concludes that the creation of the doctrine was an improper judicial attempt to legislate which has resulted in irreparable injury to the public health and welfare by delaying access to the courts until it is too late to remedy the effects of uncontrolled pollution. (Fernandez-Florida) W75-12206

THE FLORIDA ENVIRONMENTAL PROTEC-TION ACT OF 1971: THE CITIZEN'S ROLE IN ENVIRONMENTAL MANAGEMENT,

P. A. Renovitch.

Florida State University Law Review, Vol 2, No 4, p 736-765, 1974, 30 p. 181 ref.

Descriptors: *Legal aspects, *Judicial decisions, *Public rights, *Legislation, *Environmental effects, Public health, Administrative agencies, Common law, Equity, Regulation, Water law, Administration, Adjudication procedure, State Governments, Administrative decisions, Environment, Environmental control, Environmental engineering, Management, Florida.

Identifiers: *Administrative regulations, *Class action suits, *Liability (Legal aspects), *Nuisance (Legal aspects), *Standing (Legal), Environmental policy, Hazardous substances (Pollution), Injunctive relief.

In response to increased public awareness of visible environmental decay, the Florida Legislature has enacted legislation designed to forestall environmental deterioration. The reluctance of administrative agencies to enforce the law, however, has impaired the ability of concerned citizens to protect the environment. This note discusses the adequacies of the common law nuisance remedy in environmental litigation. The author discusses the strict standing requirements of the 'special in-jury' rule which inhibits the institution of public nuisance actions by private citizens. Particular emphasis is given to the granting of standing by Florida's Environmental Protection Act, and to its potential effecacy as a means of providing access to the courts, which frequently have been foreclosed by traditional public nuisance doctrine. The author criticizes the traditional practice of placing the enforcement of environmental laws in the hands of administrative agencies, and strongly endorses the Environmental Protection Act as affording citizens a voice in environmental manag ment. In conclusion, the author suggests that judicial intervention in the environmental regulatory scheme should insure effective and efficient enforcement of environmental laws. (Fernandez-Florida) W75-12207

RIVER RESTORED: OREGON'S WIL-A RIVER LAMETTE,

National Geographic Society, Washington, D. C. For primary bibliographic entry see Field 5G. W75-12210

WASTING A RIVER, California Univ., Berkeley, Coll. of Natural Resources.

B. T. Parry, and R. B. Norgaard. Environment, Vol 17, No 1, p 17-20, 25-27, (1975). 7 p, 1 fig, 4 photo, 1 tab, 9 ref.

Descriptors: *Dams, *Cost allocation, *Cost analysis, *Cost-benefit analysis, *Cost-benefit ratio, *Cost-benefit theory, Costs, Economics, Economic justification, Economic impact, Economic prediction, Inflation(Economic), Environment, Environmental control, Water "California, Flood control, Irrigation, Recreation, Fish, Wildlife, Environmental effects. Identifiers: Administrative regulations, New Melones Dam(Calif).

The degree to which economic factors are arranged in a light favorable to environmental projects has become a concern to the General Accounting Office (GAO). The New Melones Dam in California has been singled out to determine how economic assessments fall short of the objectivity which he have there are equired to display. Calculated which by law they are required to display. Calculations of the authors show vast exaggeration of the bons of the authors show vast exaggeration of the benefit-to-cost ratio resulting from the evaluation techniques used by the Corps of Engineers. The following project benefits were found to have been overstated: flood control, irrigation, power, recreation, fish and wildlife, and water quality recreation, fish and wildlife, and water quality control. Some of the errors pointed out are sub-stantial, some in themselves enough to make the stantial, some in themselves enough to make the project uneconomical. Others are not as substantial but, in combination have the same effect. In addition, the Corps utilized a project life of 100 years rather than the more recognized 50 year life. Further, it did not use the correct interest rate or consider many environmental costs. In light of these errors, it was recommended the construction of the New Melones Dam be forestalled until a reevaluation of the benefit-cost analysis be done. (Gagliardi-Florida) W75-12211

CRITICAL CHOICES SAVE SHORELINE,

In: Our Natural Resources: The Choices Ahead, Department of Interior Conservation Yearbook Series, No 10, p 58-61, 1974. 4 p, 2 photo.

Descriptors: *National seashore, *Scenery, *Shore protection, Environment, Frail lands, Seashores, Public lands, Recreation facilities, Conservation, Shores, Beaches, Aquatic environ-Identifiers: Historical values

Congressional action has resulted in the establishment of 12 national seashores and lakeshores which are administered by the National Park Service. This action was taken to help preserve the scenic treasures, recreational opportunities, and historical values of these vital, but threatened areas of our country. The effects of various national Park Service decisions on the environment of particular protected areas are scrutinized. The areas involved include the Cape Cod National Seashore, Apostle Islands of Lake Superior, Point Reyes in California, Roanoke Island of North Carolina, Padre Island along the Texas Gulf Coast, and the Sleeping Rear Dunes National Seashore of the Georgia Coast, and the Sleeping Rear Dunes National vice. This action was taken to help preserve the Coast, and the Sleeping Bear Dunes N Lakeshore of Michigan. (Hoffman-Florida)

SAVING OUR WATER RESOURCES, Office of Water Resources Research, Washington,

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In: Our Natural Resources: The Choices Ahead, Department of Interior Conservation Yearbook Series No 10, p 76-78, 1974. 3 p, 3 photo.

Descriptors: *Office of Water Resources Research(OWRR), *Training, *Water manage-ment(Applied), *Methodology, Occupations, Waste treatment, Pollutants, Estuaries, Decision making, Comprehensive planning, Resources development, Planning, River forecasting, Water resources development.

Identifiers: Water related occupations, Research projects, Chowan River.

The Office of Water Resources Research (OWRR) administers a nation-wide cooperative water resources research and training program. One thousand or more research projects are sponsored annually by OWRR in which over 2,000 university students participate as research assistants and receive valuable training for water-related posi-tions. Three studies are described showing how the OWRR program aids in water and related resources planning and management. One of these resources planning and management. One of these studies involves the Spokan River in Oregon. The research team is developing information on the sources and fate of pollutants, and what is needed to return the river to a high quality level and main-tain it at this level in the face of increasing development. In another study, a Scenic Rivers Study Unit was organized in Idaho to develop methodology for decision making and planning in the selection, use, and management of rivers falling under the 1968 Wild and Scenic Rivers Act. Talling under the 1908 wild and Scene Kivers Act.
The third study explored involved a program
established to find the causal relationships
between waste inputs and its effects on water
quality of the Chowan River estuary in the Albemanle region of North Carolina. (Hoffman-Florida)

TOWARD A CLEANER AQUATIC ENVIRON-

Environmental Protection Agency, Washington, D. C. Office of Air and Water Programs. For primary bibliographic entry see Field 5G. W75-12234

A NEPA SETTLEMENT: CONSERVATION COUNCIL OF NORTH CAROLINA V. FROEHLKE,

Northwestern Univ., Evanston, Ill. School of

For primary bibliographic entry see Field 6E. W75-12244

RECOGNITION OF SUBSTANTIVE RIGHTS UNDER NEPA,

California State Water Resources Control Board, Sacramento.

For primary bibliographic entry see Field 6E. W75-12250

DIKED DISPOSAL AREA SITE NO 12, CLEVE-LAND HARBOR, CUYAHOGA COUNTY, OHIO. Army Engineer District, Buffalo, N. Y. For primary bibliographic entry see Field 5E. W75-12255

MARITIME ADMINISTRATION PROPOSED SHORE FACILITY FOR TREATMENT AND DISPOSAL OF SHIP GENERATED OILY WATER WASTES.

Maritime Administration, Washington, D. C. For primary bibliographic entry see Field 5D. W75-12256

MAMALA BAY WASTEWATER TREATMENT AND DISPOSAL SYSTEM, OAHU, HAWAII

(FINAL ENVIRONMENTAL IMPACT STATE- 7. RESOURCES DATA

Environmental Protection Agency, San Francisco, Calif. Region IX. For primary bibliographic entry see Field 5D.

W75-12257

RIVER CROSSING PERMITS FOR BUCKEYE PIPE LINE CO. PROPOSED PETROLEUM PRODUCTS PIPELINE SYSTEM BETWEEN LINDEN, NEW JERSEY AND MACUNGIE, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer Div. North Atlantic, New York. For primary bibliographic entry see Field 8A. W75-12258

MARINE SANCTUARIES.

National Oceanic and Atmospheric Administration, Washington, D. C. For primary bibliographic entry see Field 6E. W75-1226i

ESTUARINE SANCTUARY GRANTS--APPLICA-TION AND PROCEDURES. SELECTION

National Oceanic and Atmospheric Administration, Rockville, Md. For primary bibliographic entry see Field 6E.

W75-12262

CONSERVATION SOC'Y. OF SOUTHERN VER-MONT, INC. V. SECRETARY OF TRANSPOR-TATION (REVIEW OF MOTION FOR EQUITA-BLE INJUNCTION AGAINST STREAM CHAN-NELIZATION PROJECT).

For primary bibliographic entry see Field 6E. W75-12282

HISTORICAL AND LEGAL ASPECTS OF NEPA, G. Noble.

Water and Sewage Works, Vol 122, No 5, p 86-88, May, 1975. 8 ref.

Descriptors: *Legislation, *Water pollution control, Legal aspects, Environmental effects. Identifiers: *National Environmental Policy Act(NEPA), Environmental impact statements.

The National Environmental Policy Act (NEPA) was signed into law on January 1, 1970. The historical and legal aspects of NEPA are discussed. Although the original act was really only a statement of good intention, its action forcing provisions stated that: a systematic interdisciplinary approach will be used by the agencies to insure integrated use of the natural and social sciences and the environmental design arts; and, methods will be developed to give appropriate consideration in decision making to presently unquantified environmental amentities. The main feature of the Act is the provision that requires each Federal agency to submit a statement of environmental impact in advance of each major action, recommendation or report on legislation that may significantly affect the quality of the human environment. Areas of uncertainty, such as what projects are "significant" enough to require an impact statement and what degree of latitude should exist between agency interpretations, exist under NEPA. The results of several court cases which have helped to clarify the interpretation of NEPA are presented. (Orr-FIRL) W75-12337

7A. Network Design

ERRORS AND FLUCTUATIONS OF RAIN-GAUGE ESTIMATES OF AREAL RAINFALL, McGill Univ., Montreal (Quebec).

I. I. Zawadzki.

Journal of Hydrology, Vol 18, No 3-4, p 243-255, March, 1973. 3 fig, 5 ref.

Descriptors: *Rain gages, *Rainfall, Distribution patterns, Equations, Analytical techniques, Estimating, Areal. Identifiers: Errors.

Analytical expressions for the error in the area-averaged rainfall as estimated by a network of rain gages and the fluctuations in the estimate have been derived. The actual variance of the area-averaged rainfall in terms of the mean, the mean square, and the space autocorrelation function of the areal distribution of rainfall also has been examined. The error equation is evaluated for an exponential autocorrelation function and a simple approximate expression is obtained. (Sandoski-FIRL)

W75-11933

EFFECT OF AN ERROR IN DISCHARGE MEA-SUREMENTS ON THE DETECTION PROCESS IN RUNOFF SYSTEMS ANALYSIS. Hokkaido Univ., Sapporo (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.

W75-12020

EFFICIENCY OF PARAMETER AND STATE ESTIMATION METHODS IN RELATION TO MODELS OF LUMPED AND DISTRIBUTED HYDROLOGIC SYSTEMS, Arizona Univ., Tucson. Dept. of Hydrology and

Water Resources.
For primary bibliographic entry see Field 2A.

W75-12025

7B. Data Acquisition

A COMPARISON OF THE METHODS USED TO CALCULATE FIRST ORDER BOD EQUATION

CALCULATE FIRST ORDER BOD EQUATION CONSTANTS, Rutgers - the State Univ., New Brunswick, N. J. Dept. of Environmental Science. For primary bibliographic entry see Field 5B. W75-11855

DECIPHERING OF GROUND WATER FROM AERIAL PHOTOGRAPHS, For primary bibliographic entry see Field 4B. W75-11882

MEASUREMENT OF EXTREMELY SMALL PRESSURE DIFFERENCES IN WATER, Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics. D. Weihs, and M. Sumer. Journal of Physics E: Scientific Instruments, Vol. 6, No. 1, p 77-78, January, 1973. 3 fig, 3 ref.

Descriptors: *Measurement, *Manometers, Pressure, *Pressure measuring instruments.
Identifiers: Water velocities.

A technique for measuring small pressure dif-A technique or measuring smail pressure autrepresence in water, corresponding to water velocities of down to 0.04 meters per second has been developed. The system is a modification of Preston's twin reservoir techinque, using an inclined U tube manometer. Results accurate within one percent were achieved by this system,

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which has a slightly faster response time than former techniques, in addition to being simpler in construction. (Sandoski-FIRL) W75-11915

ERRORS AND FLUCTUATIONS OF RAIN-GAUGE ESTIMATES OF AREAL RAINFALL, McGill Univ., Montreal (Ouebec). For primary bibliographic entry see Field 7A.

A MOBILE SPRINKLER IRRIGATION FACILI-TY FOR MEASUREMENT OF SURFACE RUNOFF AND SOIL EROSION (EINE TRANS-PORTABLE BEREGNUNGSANLAGE FUER DIE MESSUNG VON OBERFLAECHENABFLUSS UND BODENABTRAG), J. Karl, and H. Toldrian.

Wasser und Boden, No 3, p 63-65, 1973. 2 fig, 8

Descriptors: *Analytical techniques, *Rainfall-runoff relationships, *Soil erosion, *Infiltration, Rain gages, Measurement. Identifiers: Ground infiltration.

A mobile irrigation unit, designed for measurement of rainfall-runoff, soil erosion, and ground infiltration, can be used almost anywhere. The unit, carried on a Volkswagen bus with trailer, has 22 nozzles emitting water at a maximum of 99 mm/h. Water can be pumped from a source nearby, or transported in the bus. The precipitation is measured with 15 Hillmann rain gages on the ground and the volume of water used is checked with a water meter installed between the pump and the nozzles. The area sprinkled, 0.25 meters, is bordered off by metal sheets dug into the ground or by ditches stabilized with a holding preparation. The collecting system consists of inclined metal sheets adjoining large metal funnels with trap spaces for eroded soil and an outlet for water. Water is collected into calibrated fiber metal tubes and seepage is measured with two weight-gage cylinders staked in the ground. The work includes determinations of the ground profile and features, and soil analysis. (Holz-FIRL)
W75-11948

PHOTOGRAPHIC QUANTIFICATION WATER QUALITY IN MIXING ZONES, Wisconsin Univ., Madison. Inst. for Environmental Studies For primary bibliographic entry see Field 5A. W75-11970

A COMPUTER PROGRAM USED TO ESTI-MATE PRIMARY PRODUCTIVITY FROM PH AND CARBON DIOXIDE DATA EMPLOYING THE UPSTREAM-DOWNSTREAM METHOD, Battelle-Pacific Northwest Labs., Wash.

For primary bibliographic entry see Field 5C. W75-11971

LIDAR VS. PHOTOMETER, A ONE MONTH COMPARISON. National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.

For primary bibliographic entry see Field 5A. W75-12036

VARIATIONS OF THE TURBULENT FLUXES OF MOMENTUM, HEAT AND MOISTURE OVER LAKE ONTARIO,

Environment Service, Toronto Atmospheric (Ontario). For primary bibliographic entry see Field 2H. W75-12078

THE SPATIAL AND TEMPORAL VARIATIONS OF THE TURBULENT FLUXES OF HEAT, MO-MENTUM AND WATER VAPOR OVER LAKE

ONTARIO, National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Environmental Research

For primary bibliographic entry see Field 2D. W75-12079

USE OF ENVIRONMENTAL. ISOTOPE METHODS AS A RECONNAISSANCE TOOL IN GROUNDWATER EXPLORATION NEAR SAN ANTONIO DE PICHINCHA, ECUADOR, Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie. For primary bibliographic entry see Field 2F.

SOIL WATER MEASUREMENT WITH AN IN-EXPENSIVE SPECTROPHOTOMETER, Agricultural Research Service, Durant, Okla. Water Quality Management.

For primary bibliographic entry see Field 2G. W75-12081

W75-12080

TESTING OF CLOUD SEEDING MATERIALS AT THE CLOUD SIMULATION AND AERSOL LABORATORY, 1971-1973, Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

For primary bibliographic entry see Field 3B. W75-12099

ON THE EFFECT OF NATURAL RAINFALL VARIABILITY AND MEASUREMENT ERRORS IN THE DETECTION OF SEEDING EFFECT, Battelle-Northwest, Richland, Wash. For primary bibliographic entry see Field 3B. W75-12103

THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY AR-TIFICIAL SEEDING. PART II: TECHNIQUES FOR THE PHYSICAL EVALUATION OF SEED-

ING, Washington Univ., Seattle, Dept. of Atmospheric Sciences.

For primary bibliographic entry see Field 3B. W75-12108

THE NATURE OF WINTER CLOUDS AND PRECIPITATION IN THE CASCADE MOUNTAINS AND THEIR MODIFICATION BY AR-TIFICIAL SEEDING. PART III: CASE STUDIES OF THE EFFECTS OF SEEDING, Washington Univ., Seattle. Dept. of Atmospheric

Sciences.

For primary bibliographic entry see Field 3B. W75-12109

INFRA-RED PSYCHROMETER FOR DETECING CHANGES IN THE HUMIDITY OF LEAF BOUNDARY LAYERS,

Adelaide Univ. (Australia). Dept. of Botany. For primary bibliographic entry see Field 2I.

MAJOR LATE-WINTER FEATURES OF ICE IN NORTHERN BERING AND CHUKCHI SEAS AS DETERMINED FROM SATELLITE IMAGERY, Alaska Univ., College. Geophysical Inst. For primary bibliographic entry see Field 2C. W75-12168

RAPID SOIL MOISTURE DETERMINATION BY IMMERSION METHOD, (IN KOREAN), Institute of Plant Environment, Suwon (Republic

For primary bibliographic entry see Field 2G. W75-12240 of Korea).

FLOW QUANTITIES IN RESIDENTIAL WEEP-ING TILE SYSTEMS-A CALCULATIONAL

METHOD, Ontario Ministry of the Environment, Toronto. Pollution Control Branch. For primary bibliographic entry see Field 4A.
W75-12328

7C. Evaluation, Processing and Publication

COMPUTER SYSTEM MONITORS BATON ROUGE SEWERS. Water and Sewage Works, Vol. 120, No. 4, p 57, April, 1973.

*Monitoring. Descriptors: *Computers, Sewerage, Maintenance costs, Pumping plants, Maintenance, Data collections, Data transmis-sions. *Pollutant identification, Waste water treatstons, Folusiana, Remote reusing.
Identifiers: Baton Rouge (La), Sensors, Remote
Contact Monitor Program.

A new computer system that is helping Baton Rouge, Louisiana, monitor the condition of its sewer system on a 24-hour basis is cutting main-tenance costs by more than \$20,000 a year. Using an automatic telephone dialing units, the IBM system/7 computer places calls to telephone unit which relay tone patterns generated by sensors attached to 120 unmanned sewerage pumping sta-tions throughout the city. If the tone pattern in-dicates that a malfunction has occurred, the computer identifies the irregular response and the type of malfunction and prints a message to an operator telling him precisely what is wrong at which sta-tion. This 'Remote Contact Monitor Program' enables the computer to monitor the status of up to six contact-point sensors at any location with the proper telephone signaling equipment. (Sandoski-FIRL) W75-11927

COMPUTER'S MASTER PLAN SIGNALS SEWER PROBLEMS BEFORE THEY START, Thousand Oaks Utilities Dept., Calif. O. H. Blume, and P. B. Kline. The American City, Vol. 88, No. 5, p 96, 144, May,

Descriptors: *Computers, *Sewerage, *Model studies, Sewers, Flood forecasting, Interceptor sewers, Peak discharge, Design, Construction, Costs, California, *Pollutant identification. Identifiers: Arcadia(Calif).

Engineering Science, Inc. (E-S) of Arcadia, California, has prepared a computerized sewerage system master plan to predict sewer overloading and flooding, thus enabling the city to take preventive action. In developing the master plan, E-S and city personnel first determined the capacity of the existing sewerage system. They superimposed on existing sewerage system. They superimposed on this system patterns of anticipated growth. The computer calculated, sized, and prepared esti-mated costs of new or supplemental collection and interceptor sewers. The growth patterns included presently approved development, two other logi-cal phases of growth, and the predicted ultimate growth patterns. The program consists of a design model and a cost model. Each can be manipulated easily to simulate any condition of development. Program output includes calculated peak flows and velocity, capacity of existing sewers, size, length, and cover, and invert elevations of recomended new sewers if required. After helping design the sewers, the cost model estimates construction costs. The master plan program can analyze up to 800 separate reaches of sewer. It is written in FORTRAN extended language. The program is flexible and can be modified at nominal cost. It takes about 30 seconds to run the entire program and costs less than \$40. (Sandoski-FIRL) W75-11928

FLOOD EVENT DATA COLLATION, Institute of Hydrology, Wallingford, (England). M. J. Lowing, and M. D. Newson. Water and Water Engineering, Vol 77, No 925, p 91-95, March, 1973. 3 fig, 3 ref.

Descriptors: *Hydrologic aspects, *Floods, Rainfall-runoff relationships, Hydrographs. Identifiers: Statistical studies.

In 1967 a report from the Institution of Civil Engineers drew attention to the need to updates a 1933 publication on reservoir flooding in light of subsequent improvements of techniques in flood hydrology. A team of hydrologists started a threeyear investigation, due for completion in 1973, to year investigation, due for completion in 1973, to examine various aspects of the magnitude/frequency problem associated with flood hydrology using two approaches. One is a statistical study of instantaneous peak flows and the other is concerned with catchment response and is therfore a study of particular rainfall-runoff events. This second approach has required the collection and processing of a considerable quantity of flood event data. Antecedent condition, storm prinfall and flow hydrograph data have been as on noon event unta. Antecedent condition, storm minfall, and flow hydrograph data have been as-sembled for over 1500 events from 151 catchments. (Sandoski-FIRL) W75-11943

FLOOD PROFILES IN THE UMPQUA RIVER BASIN, OREGON: PART 3, UMPQUA RIVER BELOW SCOTTBURG, SCHOLFIELD, COW CREEK ABOVE GLENDALE, Geological Survey, Portland, Oreg. For primary bibliographic entry see Field 4A. W75-11959

WATER RESOURCES DATA FOR CALIFOR-NIA, 1973: PART 2. WATER QUALITY Geological Survey, Menlo Park, Calif. Data Report, 1975, 654 p, 2 fig, 6 tab, 23 ref.

Descriptors: *Water quality, *Surface waters, *Groundwater, *California, *Basic data collections, Streamflow, Physical properties, Sediment transport, Particle size, Water temperature, Chemical analysis, Inorganic compounds, Biological properties, Sampling, Sites, River basins, Data collections.

This basic-data report for the 1973 water year (Oct. 1, 1972-Sept. 30, 1973) for California includes records of chemical, physical, and biological characteristics of surface and groundwater. These data were collected from designated sampling sites at predetermined intervals such as once pling sites at predetermined intervals such as once daily, weekly, monthly, or less frequently, and at some sites data were recorded on punched paper tape at 15-, 30-, or 60- minute intervals. Chemical quality includes concentrations of individual dissolved constituents and certain properties or characteristics such as hardness, sodium adsorption ratio, specific conductance, and pH. The biological information includes qualitative and manitiative analyses of plankton, bottom organbiological information includes qualitative and quantitative analyses of plankton, bottom organisms, and particulate inorganic and amorphous matter present. Microbiological information includes quantitative identification of certain bacteriological, indicator organisms. Water-temperature data represent once-daily observations except for stations where a continuous temperature control of the provider of the provider information from which daily recorder furnishes information from which daily minimums and maximums are obtained. Fluvial-sediment information is given for suspended-sedi-

ment discharges and concentrations for particlesize distribution of suspended sediment and bed material. (Woodard-USGS)

GROUND-WATER BASIC DATA FOR EMMONS COUNTY, NORTH DAKOTA, Geological Survey, Bismarck, N. Dak. For primary bibliographic entry see Field 4B. W75-11963

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 6. MISSOURI

Geological Survey, Reston, Va. Available from Supt. of Documents, GPO, Washington, D.C. 20402, price \$4.70. Water-Supply Paper 2155, 1975. 554 p, 1 fig, 41 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Hydrologic data, Missiouri River, River basins, Iowa, Kansas, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wyoming, Water temperature, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Stream-flow, Gaging stations, Sampling, Sites. Identifiers: *Missouri River basin.

During the water year ending September 30, 1970, the Geological Survey maintained 258 stations on 123 streams in the Missouri River basin for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 226 of these locations for chemicalquality studies. Samples also were collected less frequently at many other points. Water tempera-tures were measured continuously at 35 and daily at 67 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical or sediment content. So far as practicable, the water temperatures were taken at about the same time ach day. Quantities of suspended sediment are reported for 38 stations during the year ending September 30, 1970. Sedi-ment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 41 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS) W75-11964

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PART 8. WESTERN GULF OF MEXICO BASINS.

Geological Survey, Reston, Va. Availble from Supt. of Documents, GPO, Washington, D.C. 20402, price \$4.50. Water-Supply Paper 2157, 1975. 532 p., 1 fig. 41 ref.

Descriptors: *Waterquality, *Surface waters, *Sediment transport, *Water temperature, *Basic data collections, Colorado, Louisiana, New Mexico, Texas, River basins, Physical properties, Par-ticle size, Chemical analysis, Inorganic com-pounds, Biological properties, Streamflow, Sam-Identifiers: *Gulf of Mexico basins(Western).

During the water year ending September 30, 1970, the Geological Survey maintained 246 stations on 144 streams in the western Gulf of Mexico basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 241 of these locations for chemical-quality studies. Samples also were col-lected less frequently at many other points. Water temperatures were measured continuously at 2 and

daily at 104 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 27 stations during the year ending September 30, 1970. Sediment samples were collected one or more times daily at most station, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of the sediments were determined at 25 stations. The stream were determined at 25 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stagedischarge relation or from a discharge measure-ment. (Woodard-USGS) W75-11965

QUALITY OF SURFACE WATERS OF THE

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 8. WESTERN GULF OF MEXICO BASIN. Geological Survey, Reston, Va. Available from Supt. of Documents, GPO, Washington, D.C. 20402, \$4.00. Water-Supply Paper 2147, 1974. 567 p, 1 fig, 40 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, Gulf of Mexico, *River basins, *Basic data collections, Colorado, Louisiana, New Mexico, Texas, Physical properties, Particle size, Chemical analysis, organic compounds, Biological properties, Streamflow, Sampling, Sites. Identifiers: *Gulf of Mexico river Identifiers: * basins(Western).

During the water year ending September 30, 1969, the Geological Survey maintained 219 stations on Its streams in the western Gulf of Mexico basin for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 214 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water tempera-tures were measured continuously at 1 and daily at 110 stations. Daily water temperatures were mea-sured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 38 stations during the year ending September 30, 1969. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 34 stations, and particle-size distribution of bed material at 4 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the com-posite period. The discharges reported in the ta-bles of single analyses are either daily mean discharges or discharges obtained at the time sam-ples were collected and computed from a stagedischarge relation or from a discharge measure-ment. (Woodard-USGS) W75-11966

SURFACE WATER SUPPLY OF THE UNITED SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS - VOLUME 3. BASINS FROM APALACHICOLA RIVER TO PEARL RIVER. Geological Survey, Reston, Va. Availble from Supt. of Documents, GPO, Washington, D.C. 20402, price \$6.15. Water-Supply Paper 2106, 1975. 764 p, 1 fig.

Descriptors: *Basic data collections, *Surface waters, *Streamflow, *Flow rates, *Southeast U.S., River basins, Atlantic Ocean, Gulf of Mexico, Alabama, Florida, Georgia, Louisiana, Mis-

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sissippi, Tennessee, Runoff, Discharge(Water), Gaging station, Flow measurement, Average flow, Lakes, Reservoirs, Hydrologic data. Identifiers: Maximum discharges, Minimum

discharges.

This report is one of a series of 37 reports present-ing records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the South Atlantic Slope and eastern Gulf of Mexico basins from Apalachicola River to Pearl River. This is one of the second series of water-supply papers to be published on a s-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for streamgaging stations gives the mean discharge for each day and is followed by montly and yearly summaries of total, average, maximum, and minimum discharge. (Woodard-USGS) W75-11967

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 6. MISSOURI RIVER BASIN-VOLUME 1. MISSOURI RIVER BASIN ABOVE WILLISTON, NORTH DAKOTA.

Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO,
Washington, D.C. 20402, price \$5.60. WaterSupply Paper 2116, 1974. 835 p, 1 fig.

*Basic data *Streamflow, *Flow rates, Missouri River, Montania, North Dakota, Wyoming, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.
Identifiers: *Missouri River basin, Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Missouri River basin above Williston, North Dakota. This is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean tooer 1, 1905, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS) W75-11968

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIP-PI RIVER-VOLUME 2. ARKANSAS RIVER

Geological Survey, Reston, Va. Available from Supt of Documents, GPO, Washington, D.C. 20402, price \$6.15. Water-Supply Paper 2121, 1974. 931 p. 1 fig.

*Basic Descriptors: collections. Streamflow, *Flow rates, *River basins, Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, Texas, Runoff, Discharge(Water), Gaging stations, Flow measurement, Average flow.

Identifiers: *Arkansas River basin, Maximum discharges, Minimum discharges.

This report is one of a series of 37 reports present-ing records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Arkansas River basin. This is one of the second series of water-supply papers to be published on a 5-year basis. The first

sereies covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS) USGS) W75-11969

SYSTEMS APPROACH TO HYDROLOGY. For primary bibliographic entry see Field 2A. W75-12014

THE STRUCTURE OF INPUTS AND OUTPUTS OF HYDROLOGIC SYSTEMS, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W75-12017

A STUDY OF LONG RANGE RUNOFF SYSTEM RESPONSE BASED ON INFORMATION

Kyoto Univ., (Japan). Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W75-12018

HYDROLOGIC SYSTEMS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-12021 OF STOCHASTIC LINEAR

NUMERICAL SIMULATION OF WATERSHED

HYDROLOGY, Texas Univ., at Austin. Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W75-12027

ENVIRONMENTAL RESEARCH LABORATORIES, 1973 ANNUAL REPORT. National Oceanic and Atmospheric Administra-tion, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab. For primary bibliographic entry see Field 5A.

APPLICATION OF A SIMPLE DISPERSION MODEL TO A RURAL INDUSTRIAL REGION, National Oceanic and Atmospheric Administra tion, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab. For primary bibliographic entry see Field 5A. W75-12037

WATER RESOURCES DATA OREGON, SURFACE WATER RECORDS, PRECIPITATION RECORDS, Oregon State Engineers Office, Salem. Water Resources Dept. C. L. Wheeler. 1974, 264 p, 4 fig.

*Oregon, *Data conecum: *Precipitation(Atmospheric), **asources, Surface Streamflow, Rivers, Streams, waters, Surface runoff, Stream gages, Gaging sta-tions, Rainfall, Rain gages, Hydrologic data, Meteorological data, Climatic data, Meteorology,

Hydrology.

The surface water records for the 1974 water year (October 1, 1973 through September 30, 1974) for gaging stations and miscellaneous sites within Oregon were presented. The base data collected at gaging stations consisted of records of stage and measurements of discharge. Observations of factors affecting the stage-discharge relation, weather records, and other information were used to sup-

plement base data in determining daily flow. The records of stage were primarily obtained from water-stage records that gave a continuous record of fluctuations. A few records of stage were obtained from direct readings on nonrecording gages.

Measurements of discharge were made with a current meter by the general methods outlined in standard textbooks on the measurement of stream discharge. Daily discharge was tabulated for each againg station, and supporting information about the gaging stations was included. Daily precipita-tion data from storage precipitation stations operated by the U.S. Forest Service were also given. (Robinson-ISWS) W75-12087

HAIL SUPPRESSION DATA FROM WESTERN NORTH DAKOTA, 1969-1972, South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences. For primary bibliographic entry see Field 3B. W75-12094

ANALYSIS OF RADAR OBSERVATIONS OF A RANDOMIZED CLOUD SEEDING EXPERI-MENT,
South Dakota School of Mines and Technology,
Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-12101

COMPARISON OF GAGE AND RADAR METHODS OF CONVECTIVE RAIN MEASURE-MENT, National Oceanic and Atmospheric Administra-tion, Coral Gables, Fla. Experimental Meteorology Lab.
For primary bibliographic entry see Field 2B.
W75-12102

THE EFFECT OF PERSISTENCE OF AGI ON RANDOMIZED WEATHER MODIFICATION EXPERIMENTS, For primary bibliographic entry see Field 3B. W75-12104 Bureau of Reclamation, Denver, Colo.

ON THE DESIGN AND EVALUATION OF CU-MULUS MODIFICATION EXPERIMENTS, Virginia Univ., Charlottesville. Dept. of Environ-mental Sciences; and Virginia Univ., Charlot-tesville. Center for Advanced Studies. For primary bibliographic entry see Field 3B. W75-12105

EVALUATION BY MONTE CARLO TESTS OF EFFECTS OF CLOUD SEEDING ON GROWING SEASON RAINFALL IN NORTH DAKOTA, South Dakota School of Mines and Technology, Rapid City, Inst. of Atmospheric Sciences. For primary bibliographic entry see Field 3B. W75-12106

BAYESIAN AND CLASSICAL STATISTICAL METHODS APPLIED TO RANDOMIZED WEATHER MODIFICATION EXPERIMENTS, Battelle-Northwest, Richland, Wash. For primary bibliographic entry see Field 3B.

POTENTIAL OF PRECIPITATION MODIFICA-TION IN MODERATE TO SEVERE TION IN MODERATE TO DROUGHTS, Illinois State Water Survey, Urbana

For primary bibliographic entry see Field 2B.

OCEANOGRAPHIC OBSERVATIONS IN THE GEORGIA BIGHT: DATA REPORT FOR R.V.

EASTWARD CRUISES E-13-73 (4-11 SEP-TEMBER) AND E-19-73 (8-9 DECEMBER 1973), Skidaway Inst. of Oceanography, Savannah, Ga. For primary bibliographic entry see Field 2L. W75-12169

COMPUTER CONTROLLED WASTEWATER RECLAMATION PLANT,

Central Contra Costa Sanitary District, Walnut Creek, Calif. For primary bibliographic entry see Field 5D. W75-12361

FLOOD PLAIN INFORMATION: ELLICOTT CREEK IN THE TOWNS OF LANCASTER AND ALDEN AND THE VILLAGE OF ALDEN, ERIE COUNTY, NEW YORK.

Army Engineer District, Buffalo, N.Y. For primary bibliographic entry see Field 6F. W75-12365

FLOOD PLAIN INFORMATION: MOORES CREEK, ALBEMARLE COUNTY AND CHAR-LOTTESVILLE, VIRGINIA.
Army Engineer District, Norfolk, Va.

For primary bibliographic entry see Field 4A. W75-12366

FLOOD PLAIN INFORMATION-COASTAL FLOODING: TOWN OF POQUOSON, VIR-

Army Engineer District, Norfolk, Va For primary bibliographic entry see Field 4A. W75-12367

FLOOD PLAIN INFORMATION: MEHERRIN RIVER, EMPORIA, VIRGINIA.

Army Engineer District, Norfolk, Va.

For primary bibliographic entry see Field 4A. W75-12368

FLOOD PLAIN INFORMATION, WILLAMETTE RIVER, JOHNSON, KELLOGG AND MT. SCOTT CREEKS, MILWAUKIE-OAK GROVE-LAKE OSWEGO, OREGON. Army Engineer District, Portland, Oreg For primary bibliographic entry see Field 4A. W75-12369

FLOOD PLAIN INFORMATION: HASSAYAM-PA RIVER, VICINITY OF WICKENBURG, ARIZONA. Army Engineer District, Los Angeles, Calif.

For primary bibliographic entry see Field 4A. W75-12370

FLOOD PLAIN INFORMATION: SPRING AND WILLOW CREEKS, HOU METROPOLITAN AREA, TEXAS. Army Engineer District, Galveston, Tex. For primary bibliographic entry see Field 4. HOUSTON W75-12371

FLOOD PLAIN INFORMATION: ONION CREEK, AUSTIN, TEXAS.
Turner, Collie and Braden, Inc., Houston, Tex.; and Army Engineer District, Galveston, Tex. For primary bibliographic entry see Field 4A. W75-12374

FLOOD PLAIN INFORMATION: JAMES RIVER, HOWARDSVILLE TO SCOTTSVILLE,
ALBEMARLE COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 4A. W75-12375

FLOOD PLAIN INFORMATION: SOUTH SAN-TIAM RIVER, LEBANON, OREGON. Army Engineer District, Portland, Oreg. For primary bibliographic entry see Field 4A. W75-12376

SPECIAL FLOOD HAZARD INFORMATION: ISSAQUAH AND TIBBETTS CREEKS, ISSAQUAH AND VICINITY, WASHINGTON. Army Engineer District, Seattle Wash. For primary bibliographic entry see Field 4A. W75-12377

SPECIAL FLOOD HAZARD INFORMATION: PARADISE CREEK, PULLMAN AND VICINI-TY, WASHINGTON.

Army Engineer District, Walla Walla, Wash. For primary bibliographic entry see Field 4A.

FLOOD PLAIN INFORMATION: HACKBERRY CREEK AND COTTONWOOD BRANCH, DAL-LAS COUNTY, TEXAS.

Army Engineer District, Fort Worth, Tex. For primary bibliographic entry see Field 4A. W75-12379

HYDROGEOLOGIC DATA FOR THE LOWER CONNECTICUT RIVER BASIN, CONNEC-

TICUT, Geological Survey, Hartford, Conn. J. W. Bingham, F. D. Paine, and L. A. Weiss. Connecticut Department of Environmental Protection, Hartford, Water Resources Bulletin No 30, 1975. 59 p, 1 fig, 1 plate, 7 tab, 10 ref.

Descriptors: *Hydrogeology, *Hydrologic data, *Connecticut River, *Basic data collections, Test wells, Drillers logs, Aquifer characteristics, Well data, Unconsolidated sediments, Particle size, Water levels, Water quality, Chemical analysis, Streams, Streamflow, Publications, Information retrieval.

Identifiers: *Lower Connecticut River basin. Geologic, groundwater, and quality of surface water data are presented for the lower Connecticut River basin, Connecticut. For this report, the basin has an area of 639 square miles in south-cen-

tral Connecticut drained principally by the main stem of the Connecticut River, by its tributaries south of Wilcox Island, and by several smaller streams which drain directly to Long Island Sound. Information collected for this investigation from July 1970 to August 1972 was supplemented by that collected in previous investigations. The primary criteria for selection were records of wells having greater than 2-hour pumping test, depths of stratified drift or till penetrated greater than 20 or 30 feet, respectively, and a location map adequate to field locate the well. The logs of 50 test holes and sieve analyses of the samples collected from them are included. Also included are chemical analyses of surface-water samples collected from 1956-1963. Data on streamflow, quality-of-water, and groundwater levels are published in many U.S. Geological Survey and State of Connecticut reports. These reports, type of data contained, and year of collection are listed. (Woodard-USGS) W75-19954

WATER-QUALITY DATA, ANCHORAGE AND VICINITY, ALASKA, Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 5A. W75-19955

8. ENGINEERING WORKS

8A. Structures

INNOVATIVE WORKOVER FOR WASSON WATER WELLS. For primary bibliographic entry see Field 3B. W75-11890

EUROPEAN DEWATERING SYSTEM AIDS QUEBEC PROJECT, For ramary bibliographic entry see Field 5D.

TOUGH DIGGING, TIGHT QUARTERS HAMPER HULL COLLECTOR SEWER JOB, For primary bibliographic entry see Field 5D. W75-11919

SEWER SUSPENDED WI STORM SEWER, For primary bibliographic entry see Field 5D. W75-11920 SANITARY SEWER SUSPENDED WITHIN

STEEL, CONCRETE FORM SEWER SUPPORT SYSTEM.

For primary bibliographic entry see Field 5D. W75-11921

FLOODS PROTECTION (SCHUTZ VOR UEBERSCHWEMMUNGEN).
For primary bibliog: aphic entry see Field 4A. W75-11946

LAYING A MAIN SEWER IN THE RESERVA-TION AREA OF THE ST. POELTEN WATER-WORKS (VERLEGUNG EINES ABWASSER-SAMMLERS IM SCHUTZ- UND SCHOEN-GEBLET DES WASSERWERKES ST. POEL-TEN).,

For primary bibliographic entry see Field 5D. W75-11947

APPLICATION OF PVC BELL-AND-SPIGOT PRESSURE PIPES IN CONSTRUCTION OF WATER SUPPLY LINES (DIE ANWENDUNG VON PVC-MUFFENDRUCKROHREN BEIM BAU VON WASSERVERSORGUNGSNETZEN), K. Friedrich.

Wasserwirtschaft-Wassertechnik, Vol 23, No 1, p 32-34, 1973. 6 fig.

Descriptors: *Plastic pipes, *Construction materials, Corrosion Control, Flow, Water supply. Identifiers: Germany, Polyvinyl chloride.

In West Germany, pipes from polyvinyl chloride (PVC) will replace between 80 and 90 percent of all pipe materials in new pipelines to be built by 1975. Advantages of PVC pipes include: Complete resistance to corrosion both inside and outside; a bigh insulating capacity, thus no correction due to high insulating capacity, thus no corrosion due to stray ground electrical currents; a high aging re-sistance; no interior incrustation; and, higher flowpassing capacity due to surface smoothness. Also simple and inexpensive joints which are easy to in-sert into the pipe end by hand can be used. The joint, together with rubber sealing, allows for all possible expansion and contraction of the pipelines. Generally a work team of 3 to 4 can lay 400 meters of pipeline in an 8-hour shift. (Holz-FIRI) W75-11949

SEWER SYSTEM EVALUATION AND REHA-BILITATION COST ESTIMATES, For primary bibliographic entry see Field 6C. W75-11951

Field 8—ENGINEERING WORKS

Group 8A—Structures

MINI-PROJECT FOR AVON HARBOR, NORTH CAROLINA,

North Carolina State Univ., Raleigh, Center for

Marine Coastal Studies.

J. L. Machemehl, and J. C. Bumgarner.

Shore and Beach, Vol 42, No 1, p 3-10, April 1974.

Descriptors: *Waves(Water), *Erosion control, *Channels, *North *Harbors. Carolina. Groins(Structures), Jetties, Channel erosion, Shore protection. Identifiers: *Avon Harbor(NC).

A detailed analysis of the various methods utilized in stabilizing the entrance of the Avon Harbor, North Carolina, was presented. The harbor was originally constructed in 1946 by the federal government. The entrance channel was repeatedly dredged until 1964; however, wave erosion made the entrance channel almost unusable. To protect it against such erosion,nylon bag groins, timber groins, and nylon bag jetties were constructed. These remedial measures were effective in maintaining the entrance channel and the harbor against storms and wave erosion. (Bhowmik-ISWS)

SMALL GROINS ON THE SHORES OF LONG ISLAND SOUND.

New York Ocean Science Lab., Montauk.

T. Ombolt Shore and Beach, Vol 42, No 1, p 11-13, April 1974. 3 fig, 7 ref.

*Shores, *Groins(Structures). Descriptors: Descriptors: "Shores, "Groins(Structures), "Erosion, 'Beaches, 'New York, 'Littoral drift, Waves(Water), Stability, Beach erosion, Shore protection, Hydraulic structures, Sands. Identifiers: "Long Island Sound, "Shoreline reces-

The main results of a groin study on the north shore of Suffolk County, New York, were summarized. A total of 51 groins constructed in 14 areas were surveyed. Over 50% of these groins were 100 feet or less in length and 90% were less than 200 feet. They were mostly constructed of rocks or pre-cast interlocking concrete blocks. Extensive use of aerial photographs was made to study the long-term changes of the shoreline due to groin construction. A trend of shoreline erosion was confirmed. The order of change was generally 30 to 50 feet over the period from 1940 to 1970. In some instances groins helped to decrease the net erosion on the order of 10 to 30 feet. Hoever, groins also had some adverse effects; 30 to 40% of the cases, increased erosion occurred downdrift of the last groin. (Bhowmik-ISWS) W75-12046

CORPS' GUIDELINES FOR DAM SAFETY IN-

SPECTION NEED REVAMPING,
Tennessee Valley Authority, Knoxville. Flood Control Branch. B. Buehler.

Civil Engineering, Vol 45, No 1, p 74-75 (January 1975). 2 p, 1 photo.

Descriptors: *Dams, *Spillways, *Dam design, *Economic justification, *Dam construction, Safety, Economics, Safety factors, Structural stability, Structural design, Dam foundation, Damsites, Check structures, Engineering geology, Retaining walls, Economic efficiency, Inspection, Dam failure, Structures, Economics, Structures, Engineering structures, Economics. Identifiers: "Dam safety, "National Dam Safety Act of 1972, Administrative regulations, Dam ef-

The Corps of Engineers, as a first step in implementing the 1972 National Dam Safety Act, recently proposed guidelines for safety inspections of existing dams. This author argues that the Corps' safety criteria are too conservative, and

IMU

will waste millions of dollars needlessly upgrading many dams. Spillway capacity is a prominent aspect of dam safety in the guidelines. Yet, the aspect is criticized for ignoring techniques suggested by the American Society of Civil Engineers task committee for pinpointing the level of spillway safety that best promotes economic efficien-The structural stability guidelines are also criticized for hinging on conventional safety factors while disregarding hazard categories. In this sense, present guideline stability criteria are inconsistent with spillway criteria. Therefore, the author suggests that modern, practical, and consistent spillway criteria are needed in order to deal effectively with low and high hazards. Several proposals are presented that the author feels would greatly increase the effectiveness of the guidelines, while at the same time releasing millions of dollars which could be used on other programs Florida) affecting human welfare. (Hoffman-W75-12241

RIVER CROSSING PERMITS FOR BUCKEYE PIPE LINE CO. PROPOSED PETROLEUM PRODUCTS PIPELINE SYSTEM BETWEEN LINDEN, NEW JERSEY AND MACUNGIE, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer Div. North Atlantic, New York.

National Technical Information Service, Spring-Va 22161, USDC as EIS-NJ-73-1917-F, \$11.25 in paper copy, \$2.25 in microfiche. December 11, 1973, 447 p, 27 fig, 25 tab.

Descriptors: *Environmental effects, *Pipelines, *Oil, *Permits, *Northeast US, New Jersey, Connecticut, Transportation, Rivers, Regulation, Federal government, Administrative agencies, Environmental control, Aesthetics, Oil pollution, Pressure conduits, Engineering structures, Conveyance structures, Pipes, Water pollution veyance structures, Pipes, sources, Water quality control.

Identifiers: *Environmental impact statements, Linden(NJ), *Macungie(Pa), Hazardous substances(Pollution)

River crossing permits are sought for construction of a subterranean petroleum pipeline to run from Linden, New Jersey to Macungie, Pennsylvania. The area is not ecologically 'unique', since it is highly modified by human activity and has been affected by an existing pipeline. Environmental impacts of the project include disruption of aquatic and terrestrial biota, soil erosion, sedimen-tation, and increased turbidity during construction in waterways. Permanent constraints will be imposed on the planting of trees along the corridor. Adverse environmental effects include: habitat disruption, flora and fauna displacement, erosion, sedimentation, increased stream turbidity, the possibility of pipeline ruptures, and esthetic impacts. Although the proposed project was the most feasible action, the following alternatives were proposed: (1) an alternate route, (2) alternate methods of transportation, and (3) no action. Con-struction and operation of the new pipeline will promote flexible use of the area and will not affect long-term productivity. Other than time, energy, material there are no irreversible and retrievable commitments of resources involved in the proposed action. Comment received indicated concern over environmental effects, but was not considered significant enough to warrant hearings. (Fernandez-Florida) W75-12258

BACTERIAL PROCESSES FOR IMPROVED OIL RECOVERY.

Tulsa Univ., Okla. For primary bibliographic entry see Field 2F.

8B. Hydraulics

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING, PART 1, Continental Oil Co., Ponca City, Okla. For primary bibliographic entry see Field 8C. W75-11865

DISPLACEMENT STABILITY OF WATER DRIVES IN WATER-WET CONNATE-WATER-BEARING RESERVOIRS, Koninklijke-Shell Exploratie en. Laboratorium, Rijswijk (Netherlands). For primary bibliographic entry see Field 4B. W75-11870

APPROACH TO PERMEABILITY REDUCTION,
Marathon Oil Co., Littleton, Colo. For primary bibliographic entry see Field 8G. W75-11872

HOLE-TO-HOLE GEOPHYSICAL MEASURE-MENT RESEARCH FOR MINERAL EXPLORA-

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 8G. W75-11873

GRAPHIC SOLUTIONS TO TUBING MOVE-MENT IN DEEP WELLS, Baker Oil Tools, Inc., Oklahoma City, Okla. N. F. Moseley. Petroleum Engineer, Vol 45, No 3, p 59-66, March,

Descriptors: *Casings, Movement, *Buckling, *Deep wells, *Graphical analysis, Graphical methods, Analytical techniques, Pressure, Temperature, Wells, Water wells, Well casings, Pipes, *Tubes

Identifiers: *Tubing movement.

Tubing movement can be divided into four classes according to the force acting on the tubings. They are: (1) movement due to piston force; (2) buckling movement due to differential pressure; (3) move ment due to a ballooning force; and (4) movement due to temperature force. These forces, with the exception of number 2, are straight line functions of pressure and temperature differential. Therefore plots may be made of the movement versus the pressure or temperature to obtain a useful h. The formulas for each of these graphs derived and an example using actual data illus-trates the derivation and use of these graphs. (Bradbeer-NWWA)

GRAPHIC SOLUTION TO FRACTURE TREAT-MENT DESIGN, Amoco Production Co., Tulsa, Okla.

C. R. Fast. Petroleum Engineering, Vol 45, No 11, p 39-46, October, 1973. 12 fig.

Descriptors: *Secondary recovery(Oil), *Hydraulic fracturing, *Graphic analysis, *Design criteria, Oil, Gas, Permeability, Porosity, Viscosity, Leakage, Reservoir leakage, Sandstone, Shale, Injection, Groundwater. Identifiers: *Fracture length, Fracturing fluid efficiency.

Results of numerous hydraulic fracturing treat-ment design calculations are summarized in graph form. The effects of formation properties, fracturing fluid properties, injection rates, and treatment volumes are all considered in the equations that describe the graphs. The design also accounts for fluid spurt loss effects and for changes in fluid properties due to proppants. The design criteria

are specified and are more or less typical of conditions encountered in thick, deep, low permeability gas reservoirs. (Bradbeer-NWWA) W75-11876

A NEW LOOK AT SANDSTONE ACIDIZING. Exxon Production Research Co., Houston, Tex. For primary bibliographic entry see Field 4B. W75-11878

THE EFFECT OF SURFACE KINETICS IN FRACTURE ACIDIZING, Halliburton Services, Duncan, Okla. L. D. Roberts, and J. A. Guin.

Society of Petroleum Engineers Journal, Vol 14, No 4, p 385-395, August, 1974. 9 fig, 3 tab, 17 ref.

Descriptors: *Fractures(Geologic), *Permeability, *Acids, *Mathematical models, Finite element analysis, Kinetics, Mixing, Laboratory tests, Secondary recovery(Oil), Chemical reactions, Groundwater, Flow augmentation.

Identifiers: *Acid fracturing, Finite-difference

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A mathematical model is developed that yields the distance to which live acid may penetrate into a fracture under conditions in which the overall reaction rate is influenced by finite surface reaction kinetics. The model is solved by an explicit finite-difference method, and the results are presented in graphical form. An example design calculation is given for HCl reaction in a dolomite calculation is given for HCl reaction in a dolomite fracture. Experimental data are presented for acid flow in limestone and dolomite laboratory-prepared fracture systems 4.1 to 9.7 feet long, at 71, 190, and 290 degrees F. From these experiments was determined a parameter appearing in the mathematical model – termed the effective mixing coefficient. The mixing coefficient has a minimum in the low Reynolds number region, indicating that pectilinear laminar flow is approach, mainium in the low Reynolds number region, in-dicating that rectilinear laminar flow is approached more closely just before the flow becomes turbu-lent. The mixing coefficient also appears to be de-pendent upon temperature in the laminar flow re-gion. The mathematical solutions given are applicable to situations in which the overall rate of acid reaction is not determined solely by mass transfer. (Bradbeer-NWWA) W75-11887

THERMODYNAMIC AND KINETIC ASPECTS OF ARGILLACEOUS SANDSTONE ACIDIZING, Institut Francais du Petrole, Rueil-Malmaison For primary bibliographic entry see Field 4B. W75-11891

A LABORATORY STUDY OF THE EFFECTS OF CONFINING PRESSURE ON FRACTURE FLOW AND STORAGE CAPACITY IN CAR-

BONATE ROCKS, Amoco Production Co., Tulsa, Okla. For primary bibliographic entry see Field 4B. W75-11892

THIN SECTION AND PERMEABILITY STUDIES CALL FOR SMALLER GRAVELS IN GRAVEL PACKING, M.S. Gulati, and G. P. Maly.
Journal of Petroleum Technology, Vol 27, p 107-112, January, 1975. 13 fig, 1 tab, 9 ref.

Descriptors: *Gravels, aquifers, *Clogging, *Wells, Pumping, *Permeability, Grain size, Sands, Unconsolidated aquifers, Screens, Well screens, Size, Filters, Collapse.

lapse.

Identifiers: *Gravel pack, *Snad bridging, *Gravel-to-sand ratio, Caving.

Sand bridging is an extensively used form of sand control in gas and oil wells and can be accom-

plished by the use of screens, gravel packs or plastic-coated gravel. Results are discussed of an experimental investigation designed to find the most effective gravel-to-sand size ratio for an effective gravel pack. A ratio of less than 6, preferably 4, will give a stable pack. Angular gravel and uniform formation sand promote the highest pack stability. Results were confirmed by the examination of this sections. (Bradbeer-W75-11893

RESERVOIR PROPERTIES AFFECTING MATRIX ACID STIMULATION OF SAND-RESERVOIR STONES.

Chevron Oil Field Research Co., La Habre, Calif. For primary bibliographic entry see Field 4B. W75.11994

GRAPHICAL METHOD SPEEDS DEVIATED

GRAPHICAL MEATHOR STANDARD GRAPHICAL WELL CASING DESIGN, Champlin Petroleum Co., Wilmington, Calif. For primary bibliographic entry see Field 8G.

TRACERS AID PLACEMENT OF STIMULA-TION FLUIDS, Getty Oil Co., Andrews, Tex. For primary bibliographic entry see Field 8G. W75-11898

MATHEMATICAL MODEL FOR HEAD-DISCHARGE RELATIONSHIPS FOR VARIOUS FERRULE-HOUSE SERVICE PIPE COMBINA-

Don Bosco Polytechnic, Calcutta (India). D. N. Ghose, and N. Chaudhuri. Journal of the Institution of Engineers, India, Vol 53, Part PH1, p 14-20, October, 1972. 10 fig, 6 tab,

Descriptors: *Mathematical models, *Pipes, Conduits, Discharge measurement, Model studies. Identifiers: Calcutta, India, Ferrules.

A mathematical model, based on the principles of hydraulics, has been developed to describe the head-discharged relationships for various comhead-discharged relationships for various com-binations of ferrules and house service pipes com-monly used in Calcutta. From the experimental results it was possible to derive the relationship Q sub x = A sub s to the nth power x (base length/length of house service pipe) to the nth power, a modification of the well established head-discharge relationship Q = KH to the nth power. In this expression, A = KI sub I to the nth power, I sub I is the base length, K the constant for a particular ferrule-service pipe combination, n = 0.54 for all combinations, and s = H/I sub x, where H is the dynamic water head in street water where H is the dynamic water head in street water main and 1 sub x the length of a house service pipe. The values of A for all combinations of ferrules and pipes were experimentally determined. Using the values of A, discharge from a given length of pipe under a given dynamic head may be computed. A set of graphs relating Q and s has been provided for all combinations of ferrules and house service pipes for quick estimation of probable dishearges. (Sandoski-FIRL)

PIPE FLOW MEASUREMENTS BY THE PULSE VELOCITY METHOD WITH RADIOACTIVE ISOTOPES, For primary bibliographic entry see Field 8G. W75-11916

APPARATUS, FOR AND METHOD OF CONTROLLING FLOW OF FLUIDS IN A PIPELINE, Talbot (F. W.) Co. Ltd., Winchester (England).

United States Patent 3, 722,520. Issued March 27, 1973. Official Gazette of the United States Patent Office, Vol 908, No 4, p 926, March 27, 1973.

Descriptors: *Pipes, *Flow control, Valves, Pipelines, Water conservation, Patents. Identifiers: Stopcocks.

A method and apparatus for controlling the flow of fluid in a supply pipe to a premises such as a water supply pipe or a gas supply pipe are described. A small bore high pressure tubing is provided preferably alongside the standard supply pipe and communicates between a main stopcock arranged to control the flow of fluid from a supply into the premises' supply pipe and the various valves in the premises. The main stopcock and the control valves have an apertured diaphragm providing the only means of communication between the small only means of communication between the sman bore tubing and the supply pipe. When one of the control valves is opened, pressure is released in the small bore tubing to lift the diaphragm off the seat of the main stopcock to permit flow of fluid through the main stopcock into the supply pipe and vice versa. Instead of relying upon pressure signals to open and close the main stopcock, elec-trical signals can be used. By fitting such apparatus into a domestic water or gas supply, water or gas will only flow into the domestic system through the main stopcock when required. Thus, wastage of water or gas in the event of a leak in the pipeline between the main stopcock and the premises will be prevented. (Sandoski-FIRL) W75-11932

SWIRLING LAMINAR PIPE FLOW

SWIRLING LAMINAR PIPE FLOW OF SUSPENSIONS, Illinois Univ., Urbana. Dept. of Mechanical and Industrial Engineering. S. K. Tung, and S. L. Soo. Journal of Applied Mechanics, Vol 95E, No 2, p 331-336, June, 1973. 5 fig, 22 ref.

Descriptors: *Mathematical studies, *Pipe flow, Velocity, Hydraulics, Hydraulic models, Reynolds number. Identifiers: Flow of suspensions, Navier-Stokes

Vortex pipe flow of suspensions with laminar mo-tion in the fluid phase has been examined. The pipe consists of two smoothly joined sections, one stationary and the other rotating with a constant stationary and the other rotating with a constant angular velocity. The flow properties of the fluid phase are determined by solving the complete Navier-Stokes equations numerically with governing parameters being the flow Reynolds number and swirl ratio. Subsequent numerical solution to the momentum equations governing the particulate phase provides for both particle velocity and concentration distributions. The method can be applied to many other fluid flow or two-phase flow rotablems. It also provides an easy check on the problems. It also provides an easy check on the results obtained by using some other approxi-mated methods. (Sandoski-FIRL) W75-11938

SYSTEMS SIMULATION OF STREAMFLOWS, Kyoto Univ., (Japan), Dept. of Civil Engineering. For primary bibliographic entry see Field 2E. W75-12024

SIMULATION OF THE SHORT-TIME SCOUR-FILL PROCESS IN ERODIBLE STREAMS WITH STOCHASTIC SEDIMENT TRANSFER AT THE STREAM BED, Utah Water Research Lab., Logan. For primary bibliographic entry see Field 2J. W75-12029

VERTICAL TEMPERATURE PROFILES IN OPEN-CHANNEL FLOW, Dar es Salaam Univ. (Tanzania). For primary bibliographic entry see Field 5B.

Field 8-ENGINEERING WORKS

Group 8B—Hydraulics

FLOW QUANTITIES IN RESIDENTIAL WEEP-ING TILE SYSTEMS-A CALCULATIONAL

METHOD, Ontario Ministry of the Environment, Toronto. Pollution Control Branch.

For primary bibliographic entry see Field 4A. W75-12328

HOW TO EVALUATE WATER MAIN CAPACI-

TIES, PART I, M. D. Curry, and R. R. Wright. Water and Sewage Works, Vol 122, No 5, p 98-101, May, 1975. 2 fig. 3 tab.

Descriptors: *Water distribution(Applied),
*Pipelines, *Roughness coefficient, *Head loss, Hazen-Williams equation, Roughness(Hydraulic). Pipe flow, Water conveyance.

Periodic evaluations of water distribution systems should be performed to protect the monetary in-vestment in constructing this portion of the water supply system. Generalized procedures are availa-ble that permit field flow tests and express the system performance in quantitative terms. The importance of the roughness value (C factor) in dis-tribution main analyses is stressed. The C factor is used in the Hazen-Williams formula for hydraulic calculations and represents the resistance to flow or roughness coefficient. Determination of C factors of arterial mains allow the main capacity to be expressed in quantitative terms for comparison with expected performance. The C represents quantitatively the head loss in a pipe. Variation in resistance to flow affects the friction loss in a water main and the flow capacity. The C factor is affected by inside pipe diameter and by pipe roughness. Visual observation of sections of a water main may not show the actual roughness present throughout the pipe. Typical C factors for various pipes are given. Four case studies representing C factors determined in the field are presented. Actual values to be expected in any particular community are dependent upon such parameters as the type of water treatment used, control of the treatment processes, soil conditions, and velocities. Measures are mentioned that will aid in the prevention of loss of main capacity.

(Orr-FIRL)

W75-12329

WATERFLOODING OF OILFIELDS IN WYOM-

ING TO 1968, Bureau of Mines, Laramie, Wyo. Mineral Resources Field Office. P. Biggs, and C. A. Koch.

Report of Investigations 7469, December, 1970. 147 p, 32 fig, 4 tab, 7 ref.

*Flooding(Oil Descriptors: recovery). *Groundwater, Wells, *Oil industry, Permeability, Aquifer characteristics, *Wyoming. Identifiers: Waterflood projects, Reservoir data,

Oil-in-place, Oil production, Madison Forma-tion(Wisc).

Information is provided on 138 waterflood projects in Wyoming. Injection was in 25 producing zones and 65 fields. Specific data presented include field location, discovery and development, water supply and injection, oil and water production, estimates of oil in place, and oil recoveries by primary and secondary methods. The 138 projects studied will, if successful, recover about 800 million barrels of secondary oil. Almost all of the injection water is from deep water wells. Estimated water requirements total 1,225,000 acre-feet. The equivalent of 237,000 acre-feet had been injected by January, 1968. The Elk Basin-Madison and Salt Creek-Second Wall Creek projects each expect to recover more than 100 million barrels of oil by waterflooding. Totaling all projects, the daily production in December, 1967, was 195,600 bar-rels of oil and 501,500 barrels of water. Most of the injection water is from the Madison Formation and is unfit for domestic or agricultural use.

Usually a closed water system is used, and occasionally filtering and chemical additives are necessary. (Campbell-NWWA) 75-12380

FLUID FLOW IN CHANNELS, CAPILLARIES, AND POROUS MEDIA UNDER THE IN-FLUENCE OF AN ELECTRIC FIELD,

Bureau of Mines, Morgantown, W. Va. Petroleum Research Lab. For primary bibliographic entry see Field 2F.

W75-12381

PREDICTION OF PENETRATION RATE FOR PERCUSSIVE DRILLING,

For primary bibliographic entry see Field 8E.

PERCUSSIVE DRILLING: WITH INDEPENDENT ROTATION, Bureau of Mines, Twin Cities, Minn. Twin Cities

Mining Research Center.

For primary bibliographic entry see Field 8E. W75-12383

DRILLABILITY STUDIES: PERCUSSIVE DRILLING IN THE FIELD, Bureau of Mines, Twin Cities, Minn. Twin Cities

Mining Research Center. For primary bibliographic entry see Field 8E. W75-12384

GROUND WATER AND GROUND-WATER CONTROL,

For primary bibliographic entry see Field 4B. W75-12386

SPECIALIZED UNDERGROUND EXTRACTION SYSTEMS.

SPE Mining Engineering Handbook, Vol 2, Section 21, p 21-2 to 21-78, 1973. 48 fig, 7 tab.

Descriptors: *Mining, Aquifer characteristics, Cementing, Cements, Nuclear logging, Resistivity logging, Borehole geophysics, Casing.

Identifiers: *Solution mining techniques, In situ mining, Potash, Halite, *Brine disposal, Leaching, Well completion, Hydraulic fracture, Multiple well systems, Well costs, Sulphur, Microbial ac-

Solution mining techniques present a means of extracting soluble ores, particularly such materials as salt and potash, from horizons which are not accessible by conventional mining. In the process of dissolving materials, it is evident that solution may be complete or partial. In general, the solution mining operations are described and relate to complete solution of the desired compound. Even though the solution of material is complete, there may be instances in which insoluble material is present to a large extent either as granular separated particles or as insoluble layers. The separate parties of as insolute layers. In-process required for obtaining the desired product involves access wells to reach the deposits, suffi-cient water supply to yield the production goals, and the development of an underground cavity. The process of solution mining, therefore, de-pends to a great extent on three factors: availability of a relatively pure strata or formation of salt or potash to be mined, access well or wells, and adequate control of the solutioning process so that enlargement of underground cavities can be fairly well delineated. (Campbell-NWWA) W75-12388

WELL STORAGE.

J. Waddell.

Water Well Journal, Vol 29, No 8, p 22-23, August,

Descriptors: *Water wells, Groundwater, *Aquifer testing, Drawdown, Aquifer charac-teristics, Safe yield, Aquifers, *Wells, Casing. Identifiers: *Well storage, Well recovery, Long range production, Well design, Pump costs, Power costs, Low capacity wells.

Marketing factors other than initial well cost are discussed in terms of long range production, pump unit life, power costs, and well storage. Well storage is most important in areas where the aquifer is of limited thickness or if the formation is tight and wells have a rapid drawdown and low capacity with slow recovery. Well casing size is discussed in terms of pump starting periods. A sixinch casing offers a greater storage than a 4 inch casing and requires fewer pump starts per hour, lower power costs and greater recoveries in case of energy requirements. Pressure tank size is also discussed in terms of available storage. A comprehensive chart is presented that shows optimum requirements of casing size, drawdown and annular volume. (Campbell-NWWA)

RECENT APPLICATION OF GEOPHYSICAL METHODS IN COAL MINING.

National Coal Board, London (England).

In: Ninth Commonwealth Mining and Metallurgical Congress 1969, Mining and Petroleum Geology Section, Paper 23, 19 p, 7 fig, 3 tab, 7 ref, 1 ap-

Descriptors: *Borehole geophysics, Surface geophysics, Resistivity, *Mining, *Wells, Coals, *Well logging.

Identifiers: Density logging, Coal properties, Thermal conductivity, Gamma logging, Neutron logging, Surface gravity, Surveying, Continuous seismic marine profiling, Refraction profiling.

Land and marine geophysical methods applied to coal mining are reviewed and their limitations are discussed by the use of examples drawn from typi-cal surface surveys, mainly where a knowledge of the fault trends would have reduced mining risks. Underground methods are described and examples are given to illustrate favourable site conditions. Present limitations of these methods are assessed and possible lines of development are indicated. It is suggested that the most promising approach de-pends on the development of underground seismic pends on the development of underground seismic methods using the marked density contrast of the coal seam as the main parameter. Mining risks are being reduced by the use of geophysical techniques, using the marked physical properties of the coal seam. The development of an aid using the coal seam as a waveguide offers the best chance of success and the greatest possibilities of an increased range. Surface methods will continue to be used to assist in mine planning. (Campbell-NWWA) W75-12396

TURBO-DRILLING AS APPLIED TO POTASH DEVELOPMENTS IN THE SASKATCHEWAN

PIELD,
Cementation Mining, Ltd., London (England).
J. N. Adamson, and J. H. Storey.
In: Ninth Commonwealth Mining and Metallurgical Congress, 1969, Mining and Petroelum Geology Section, Paper 19, 14 p, 5 fig, 2 tab.

Descriptors: *Rotary drilling, *Wells, Cost analysis, Drilling equipment, Cementing, Drilling, *Mining, *Canada.

Identifiers: *Turbo-drilling, *Potash, Borchole deviation control, Wedging, Blairmore formation, *In situ mining, Lost circulation.

Control of borehole deviation in drilling the ring of holes (4-5 ft apart and 2000 ft deep) required in shaft-sinking in the Saskatchewan potash field by the freezing method is discussed. A system of turbo-drilling with directional 'kick-sub', instead

ENGINEERING WORKS—Field 8 Hydraulic Machinery—Group 8C

of wedging, was adopted to correct deviations in the rotary-drilled freezing holes around Esterhazy, ne rotary-drilled reezing holes around saternazy, Cominco, Duval, and Patience Lake shafts. The drilling rigs and equipment used are outlined, and the surface layout adopted for simultaneous multi-rig drilling with minimum transfer time between holes is described. Problems encountered during noies is described. Problems encountered during the drilling of the glacial till and the Blairmore For-mation are referred to, and the cementing procedure employed is described. The experience of the use of turbo-drilling in freeze-hole drilling has been very satisfactory since its first use at Esterhazy. The precision in the hole patterns achieved over these 6 shafts has demonstrated the practicability of this technique and justified the original concept of applying turbo-drilling for freeze-hole application. From the point of view of the mining engineer, the precision locations of the freeze holes enabled the construction of the relatively thick and uniform ice walls to withstand the high hydrostatic pressures at these depths to be nigh nyurostatic pressures at these depths to be carried out safely. The speed of operation was pre-dictable—an essential factor in the critical path programs for these very expensive projects. (Campbell-NWWA) W75-12397

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APPLICATION OF WELL LOGGING TECHNIQUES TO MINING EXPLORATION

British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre. For primary bibliographic entry see Field 8G. W75-12398

FRESH WATER STRATA OF MISSISSIPPI AS REVEALED BY ELECTRICAL LOG STUDIES, Millsaps Coll., Jackson, Miss. For primary bibliographic entry see Field 4B.

8C. Hydraulic Machinery

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING, PART 1, Continental Oil Co., Ponca City, Okla. W. H. Fertl, and D. J. Timko. World Oil, Vol. 174, No. 7, p 67-70, June, 1972. 4

Descriptors: *Pressure, *Hydrostatic pressure, *Drilling, *High pressure, Wells, Water wells, Oil wells, Deep wells, Pressure head, Groundwater. Identifiers: *Pressure gradient, *Formation pressure gradient, *Formation pressure, *Formation pre

This first article in a 10 part series covering all aspects of determining and evaluating formation pressures discusses basic subsurface pressure concepts. It defines hydrostatic pressure, overbur-den pressure and formation pressure. Subnormal pressure and formation pressure. Succonformation pressures are shown in example and some explanations are given. Abnormally high pressures are reviewed and sixteen possible causes of high pressures are pressured. (See W75-11866 thru W75-11869) (Campbell-NWWA) W75-11865

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING, PART 2, DETECT-ING AND EVALUATING FORMATION PRES-

Continental Oil Co., Ponca City, Okla. W.H. Fertl, and D. J. Timko. World Oil, Vol 175, No. 1, p 45-50, July, 1972. 3 fig. 1 tab, 27 ref.

Descriptors: *Drilling, *Temperature, *Pressure, *High pressure, *Measurement, Geophysics, Drilling mud, Techniques, Evaluation, Oil, Groundwater. Identifiers: Abnormal pressure, Formation pressure, Drill cuttings.

The methods of detection of formation pressures and an evaluation of these methods as to their effectiveness, are presented. About 35 detection methods are described. These are divided into 6 categories in relation to the source of data. The categories are: (1) geophysical methods, (2) drilling parameters, (3) drilling mud, (4) drill cuttings, (5) well logging, and (6) direct pressure measuring devices. (See also W75-11865) measuring devices. (Bradbeer-NWWA) W75-11866

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING, PART 3, OVER-PRESSURE DETECTION FROM WIRELINE METHODS.

W. H. Fertl, and D. J. Timko. World Oil, Vol. 175, No. 2, p 36-39, August, 1972.

Descriptors: *Drilling, *Temperature, *High pressure, *Acoustics, Electrical well logging, Borehole geophysics, Bulk density, Techniques, Evaluation, Gravimetric analysis, Geophysics, Oil, Groundwater.

Identifiers: *Wireline techniques, *Overpressure,

Shale formation factor.

Information on overpressured intervals in a borehole is important in well planning. The response of various wireline logging devices to overpressures are described. A comparison of results is made with other methods used to locate transition zones from normal to high pressures. (See also W75-11865) (Bradbeer-NWWA) W75-11867

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING, PART 9, NAVEL WAYS TO DETECT ABNORMAL PRESSURE,

Continental Oil., Ponca City, Okla. W. H. Fertl, and D. J. Timko. World Oil, Vol. 176, No. 2, p 47-50, February 1, 1973. 5 fig. 21 ref.

Descriptors: *Drilling, *High pressure, *Borehole geophysics, Bicarbonate concentration, Hydrogen ion concentration, Chemistry, Well data, Deep wells, Groundwater. Identifiers: *Shale slurry, *Drill cuttings

Recent field and lab work indicate new methods soon may be available for predicting pressure of abnormally high pressured formations. Five unusual parameters that may be affected by high pressure including bicarbonate concentration in formation brines and shale water, reduction-oxidation optential and pH of shale slurry filtrates are discussed. (See also W75-11865) (Bradbeer-NWWA) W75-11868

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING, PART 10, MISCELLANEOUS WAYS TO DETECT AB-

MISCELLANEOUS WAYS TO DETECT ASS NORMAL PRESSURE, Continental Oil Co., Houston, Tex. D. J. Timko, and W. H. Fertl. World Oil, Vol. 176, No. 4, p 63-65, March, 1973. 5

Descriptors: *Drilling, *High pressure, *Temperature, *Prediction, Borehole geophysics, Oil, Deep wells, Groundwater, Resistivity, Filtra-Identifiers: Shale cuttings.

Some unusual methods for detecting the presence of abnormal pressures ahead of the bit are being investigated. Resistivity, filtration rate and moisture index of shale cuttings, slurry, and the product of shale bulk density and moisture index are correlated with downhole pressure environments. (See also W75-11865) (Bradbeer-NWWA) W75-11869

TESTS SHOW JET DRILLING HAS PROMISE, Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands). R. Feenstra, A. C. Pols, and J. van Steveninck Oil and Gas Journal, Vol 72, No 26, p 45-57, July 1, 1974. 12 fig, 6 tab, 23 ref.

Descriptors: *Jets, *Drilling, *Deep wells, *Drilling equipment, Flow, Nozzle, Drilling fluids, Hydraulics, Laboratory tests, On-site investiga-tions, Shale, Wells, Oil wells, Water wells. Identifiers: *Jet drilling, Groningen gas field, Shell

An investigation was made with the aid of three laboratory-type drilling machines which permit tests on both microbits (1.5 in) and full-scale bits tests on both microbus (1.5 m) and unle-scale oils (6.5 - 9.628 in). In view of the application of jets to deep wells, care was taken to simulate hydrostatic pressures as they exist in the field on the hole bot-tom. These have a major effect on bit-penetration rate. The extensive experiments performed are listed and their procedure recorded. The results of the laboratory tests are presented. Field tests in tertiary shales below 1700 ft at the Groningen gas field show that 9.628 in holes could be jetted in weak formations at satisfactory rates using 5000 psi equipment. (Bradbeer-NWWA) W75-11880

NEED WAYS TO REDUCE DRILLING COSTS.

C. C. Daly.
Oilweek, Vol 23, No 52, p 12-13, February 12, 1973. 2 fig.

Descriptors: *Drilling, *Costs, *Cost-benefit anal-ysis, *Economic efficiency, Oil wells, Water wells. Identifiers: Penetration rate, *Drilling rate.

Several methods of reducing drilling costs were tested in problem boreholes such as those that penetrated Mississippian shales that have a tendency toward a sloughing after being water-wet for a number of days. Non-wetting lubricants were used, such as Drispac Soltex, a polyanionic cellulosic polymer and a sodium asphalt sulfonate.
They substantially increased penetration rates.
(Bradbeer-NWWA)
W75-11884

WANTED: FEWER BIT, CASING SIZES, RE-WARD: MANY BENEFITS FOR INDUSTRY, Armco Steel Corp., Middletown, Ohio. R. L. Vingoe, and J. H. Cook. Drilling, Vol 36, No 7, p 33-39, May, 1975. 1 fig, 6

Descriptors: *Drilling equipment, *Water wells, *Oil wells, *Casings, *Drill bits, Size, Weight, Statistical analysis, Economics, Standards.

A substantial reduction in the number of sizes of rock bits and the number of sizes and weights of casing furnished industry would result in many benefits, including delivery of the products, all in critical supply, beneficial elimination of little-used items, and standardization of a more streamlined product line. A group of Armco and Hughs person-nel was formed to standardize on an optimum number of sizes and weights of bits and casing number of sizes and weights of bits and casing which would satisfy the industry's requirements. A study was made to determine the existing demand for various product sizes and the data are presented. (Bradbeer-NWWA) W75-11885

BIT DESIGN IS KEY TO DEEP DRILLING WITH TURBINES, Shell Oil Co., New Orleans, La.

J. E. Fontenot. Oil and Gas Journal, Vol 73, No 23, p 39-43, June 9, 1975. 11 fig, 4 ref.

Field 8—ENGINEERING WORKS

Group 8C—Hydraulic Machinery

Descriptors: *Design criteria, *Drilling equipment, *Turbines, *Rotary drilling, Electric motors, Drilling, Wells, Deep wells, Ground water, Oil, Performance, Efficiencies. Identifiers: *Diamond bit design, Torque, Down-

hole motor, Drill bit, Drill string.

The use of a downhole mud motor in place of a rotary drill could increase the ability to put power down the borehole efficiently. There is an increase in the specific horsepower per square inch availa-ble at the bottom of the hole with the turbine mud motor. This increased available power allows deep drilling with less torque on the drill pipe than a rotary drill, thus keeping expenses on drill pipe maintenance to a minimum. Rock bits have peron drill pipe formed poorly, however, on the turbine, and the results using diamond bits have been inconsistent. The diamond bit should be studied and redesigned to feature low torque, good cleaning at low bit-pressure drop, high penetration rate at low weights on bit and long life (50-100 hr). (Bradbeer-NWWA)

DRILLING IMPEDANCE OF MUD SOLIDS,

M. D. Nelson. World Oil, Vol 180, No 2, p 55-60, February 1, 1975. 5 fig, 5 ref.

Descriptors: *Drilling, *Penetration, *Drilling fluids, Boreholes, Clays, Brines, Emulsions, Mud, Slurries.

Identifiers: *Specific drilling impedance, Mud solids, Drilling rate.

Solids in drilling fluids adversely affect drilling rates, and relative comparisons of different types of solids have been made in the past. However, new information is presented that includes a method of determining the quantitative effect a particular solid has on drilling. Specific drilling im-pedance is a measure of the amount solids reduce penetration rates, under a given set of conditions. (Bradbeer-NWWA) W75-11897

INFLATABLE PLUG CUTS MESS, CLEANUP ON SEWERLINE BYPASS,

Robbinsdale Water and Sewer Superintendent's Office, Minn. G. Austin.

The American City, Vol 88, No 4, p 22, April, 1973. 1 fig.

Descriptors: *Sewers, *Repairing, *Bypasses, Floods, Castings, Aluminum, Construction materials, Equipment, Waste water treatment. Identifiers: Inflatable plugs, Sewer repair.

A specially designed inflatable plub, used for A specially designed inflatable pludy, used tor bypassing when sewer repairs are required, eliminates flooding and the ensuing cleanup problems. The plugs, known as Muni-Balls, are manufactured by Cherne Industrial, Incorporated, manufactured by Cherne Industrial, Incorporated, of Edina, Minnesota and come in sizes from 6 to 53 inches in diameter. Made of an elastic compound and molded on high tensile strength aluminum castings, they include a removable plug in the center ranging from 1 to 4 inches in diameter. (Sandoski-FIRL.)
W75-11908

SEATTLE PROJECT CALLS FOR ROCK For primary bibliographic entry see Field 4A. W75-11922

SUPERPOSITION OF TWO PIPES IN A COM-MON, MIXED SEWER SYSTEM (RECOURS A LA SUPERPOSITION DE DEUX CONDUITES DANS UN RESEAU D'ASSAINISSEMENT UNITAIRE). For primary bibliographic entry see Field 5D. W75-11923

MI

FLEXIBLE JOINT FOR SEWER PIPE For primary bibliographic entry see Field 5D. W75-11931

A PRACTICAL PROPORTIONAL WEIR, Sri Venkateswara Univ., Tirupati (India), Dept. of

Civil Engineering. P. Venkataraman, and K. Subramanya Water Power, Vol 25, No 5, p 189-190, May, 1973.

Descriptors: *Mathematical studies, *Weirs, Flow rates, Flow measurement, Outlets, Sampling, Waste water treatment.

Sediment chambers, Analytical profiles, Linear proportional weirs.

Linear proportional weirs are those weirs for which the rate of flow is proportional to the linear power of the head measured above the datum. Because of this characteristic these weirs find their use as flow measuring devices, outlets for sediment chambers, and controls for float-regu-lated dosing and chemical sampling. In the lated dosing and chemical sampling. In the Keshavamurthy and Seshagiri generalized theory of proportional notches, the shapes of the weir profile designed to maintain the linear relationship between the head and discharge are complex while being analytically sound. To simplify the profile for purposes of practical application while main-taining the essential linear proportional quality, an experimental investigation was conducted utilizing a weir formed by two quadrants of a circle. The quadrant plate notch can thus be used to obtain a linear proportionality between the head and discharge This device has the advantage of simplicity of profile and is thus easy to construct, and in addition it does not have the restrictions imposed on some of the exact analytical profiles. (Sandoski-FIRL) W75-11937

SCREEN RETAINER ASSEMBLY, Robertshaw Controls Co, Richmond, Va.

D. K. Murren. United States Patent 3,732,985. Issued May 15, 1973. Official Gazette of the United States Patent Office, Vol 910, No 3, p 832, May 15, 1973.

*Screens, *Conduits, *Patents, Descriptors: Equipment, Installation.
Identifiers: *Screen retainer assembly.

A screen retainer assembly for use in a conduit is described. The method includes the steps of drap-ing the screen across a convoluted band of ductile ing the screen across a convoluted band of ductile material, positioning the screen-draped band within the conduit in general alignment with a continuous groove provided in the interior surface of the conduit, and expanding the convoluted band so that the band fits snugly in the groove thus to hold the screen firmly in place with its periphery pinched between the band and the groove. The resultant screen retainer assembly has the advantages that the screen retaining means does not impede the flow of fluid through the conduit and that the expanded band cannot become displaced or accidentially removed. (Sandoski-FIRL) W75-11942

POWER CONVERSION APPARATUS FOR UTILIZING THE FORCE OF WAVES, For primary bibliographic entry see Field 3E. W75-12062

DIGESTER GAS: VALUABLE PLANT FUEL South Burlington Waste Treatment Plant, N. C. A. D. Everett. Water and Sewage Works, Vol 122, No 5, p 60-61, May, 1975. 4 fig.

Descriptors: *Methane, *Instrumentation, Natural gas, Fuels, Equipment, North Carolina, *Gases, *Treatment facilities, Recycling. Identifiers: *Digester gas.

The South Burlington waste treatment plant, Burlington, North Carolina, uses digester gas (Essentially methane) to power three 150-hp ennes at a rate of 1200 scfh to drive the centrifugal blowers for the aeration tanks. Approximately \$4,000 per year in fuel costs are saved by using digester gas instead of natural gas. American Meter rotating-vane type positive displacement meters have been installed in place of the conventional diaphragm meters commonly used for a check on digester gas consumption. Two meters are used in the system, one measures digester gas to the three air blower engines and the other measures excess digester gas that must be consumed in a waste burner. Greater than 95% of the digester gas produced is normally used. Periodic readings of the two meter totalizers show the total gas usage. An interchangeable measuring cartridge contained on the CVMP-S meter simplifies maintenance and maintains the meter's accuracy. Dirt, pipe scale, and corrosive vapors are prevented from reaching the gears by a magnetic drive on the meter which enables the gear box to be isolated from the flowing digester gas. Pre-lubricated bearings are sealed so that they are not exposed to the degreasing effect of digester gas condensates. The meters may be installed horizontally in threeinch pipe loops or mounted in vertical lines. (Orr-

W75-12332

RESORT COMMUNITY PUTS ALL UTILITIES UNDERGROUND.

For primary bibliographic entry see Field 8G. W75-12338

RECENT DEVELOPMENTS OF INSTRUMEN-TATION, CONTROL AND AUTOMATION SYSTEMS FOR WASTEWATER TREATMENT SYSTEMS.

Tokyo (Japan). Sewerage Bureau. For primary bibliographic entry see Field 5D. W75-12341

PRESSURE CONTROL IN A MOUNTAIN AREA WATER SYSTEM.
Public Works, Vol 106, No 5, p 100-101, May,

1975. 1 fig.

Descriptors: *Water pressure, *Mountains, California, Valves, Hydrants, Design, Energy dis-sipation, *Water distribution(Applied), Water

The Crestline-Lake Arrowhead Water Agency, located northeast of Los Angeles in the San Bernardino mountains, draws water from the Feather River Aqueduct. It wholesales this water to 27 outlets servicing 10,000 customers, and also acts as a fire service. During design of the system, it became apparent that to maintain a practical distance between hydrants, many hydrants would be placed in areas where the pressure (850 psi) would exceed the capabilities of the fire fighting would exceed the capabilities of the IIre fighting equipment. Therefore, the agency built a test facility costing \$27,000 to evaluate the capability of control valves needed to reduce pressures. Cavitation was observed below the valve rather than within it-10 to 15 diameters downstream of than within it-10 to 15 diameters downstream of the valve. A temporary energy dissipator was devised consisting of river rocks (3/4 to 1-inch) stuffed into a 4 1/2-foot long section of a 6-inch water main, with 1/4 by 1-inch steel bars welded across the end of the piece. With cavitation taking place in the dissipator, the rocks appeared to have been split in half. The rocks and bars were evaluated, and a permanent dissipator was designed and patented. The configuration of the energy dissipator can be changed to meet flow demand condi-tions. The tube-like device has been made in lengths of 18 inches to 4 1/2 feet, and is filled with steel balls furnace-welded together. (Murphy-FIRL) W75-12343

WATER PLANT GOES AUTOMATIC.

Iowa City Water Superintendent Office. C Kron.

Water and Wastes Engineering, Vol 12, No 5, p 59-61, May, 1975. 2 fig.

Descriptors: *Treatment facilities, *Automation, Rivers, Deep wells, Pumps, Flow rates, Intakes, Water quality control. Water treatment, Iowa. Identifiers: Iowa City(Iowa), Iowa River.

The Iowa City, Iowa, Municipal Water Treatment Plant has become completely automated as a result of its recent moderinization program. The decision to computerize the entire facility was due to rapidly changing water conditions with widely varying seasonal conditions typical of mid-western rivers, presenting special treatment problems prior to distribution. To supply its 50,000 customers, Iowa City gets only 5% of its water from a deep well which requires only chlorination and settling before distribution. The remaining 95% is pumped from the Iowa River. A digital computer will control the following areas: high service pumps (Starting and stopping the pumps in relation to system demand); rate of flow, by monitoring the clear well level and by calculating the rate of flow to maintain the clear well level; and operation of pumps at the river intake structure, to supply adequate water for maintaining the desired plant flow rate. Part of the computer program also controls the filter effluent valves. Chemical feed, skimming gates, backwash, and sludge blowoff are controlled by determining the quality of the raw water. (Dean-FIRL) W75-12345

8E. Rock Mechanics and Geology

GRAPHIC SOLUTION TO FRACTURE TREAT-

MENT DESIGN, Amoco Production Co., Tulsa, Okla. For primary bibliographic entry see Field 8B.

PREDICTION OF PENETRATION RATE FOR PERCUSSIVE DRILLING, A. A. Selim, and W. E. Bruce.

Report of Investigations 7396, June, 1970. 21 p, 13 tab, 10 ref, append.

Descriptors: *Drilling, Drilling equipment, Mining, Rock mechanics, *Wells, Ground water, Core drilling.

Identifiers: *Percussive drilling, Penetration rate, Multicollinearity, Compressive strength, Tensile strength, Young's modulus, Coefficient of rock

The feasibility of predicting percussive drilling rates by equations derived from statistical regression analysis is described. The least squares statistical method was used and the analysis was performed both by direct and by stepwise linear regression analysis. The predicted penetration rate is a function of the drill power and the physical properties of the rocks penetrated. The results show promise that the technique may be of value in providing a mathematical model by which perssive drill manufactures and users can predict the performance of a given drill. Experimental work involved two mining type percussive drills. Penetration data for these drills were determined from nine rocks drilled in the laboratory. Drill work rates (power) were determined in a separate series of experiments. Rock physical properties were measured from diamond-drill core samples taken from the same blocks used for percussive drilling, (Campbell-NWWA) W75-12382 PERCUSSIVE DRILLING: WITH INDEPEN-DENT ROTATION,

Bureau of Mines, Twin Cities, Minn. Twin Cities Mining Research Center. H. F. Unger, and R. R. Fumanti.

Report of Investigations 7692, 1972. 21 p, 16 fig, 4

Descriptors: *Drilling, *Drilling equipment, Mining, Rock strength, *Wells, Core drilling, Rock mechanics, Sampling, Bits. Identifiers: *Percussive drilling, Rock properties,

Rotational speed, Drilling thrust, Penetration rate, Surface-set diamond bits, Impregnated diamond bits, Diamond drilling data, Laboratory drilling tests, Field drilling tests, Energy requirements.

The Bureau of Mines conducted drilling experiments in the laboratory with a commercially available percussive drill that has an independent rotational system. Eight rock types with a wide range of physical properties were drilled under several combinations of rotational speed, drilling thrust, and operating pressure. Penetration rates and energy per unit volume correlated well with the coefficient of rock strength as shown graphically. Size-distribution analyses of some of the cany size-uning show how particle size varies with rotation speed and rock hardness. In general, changing the rotational speed has a greater influence on the penetration rate in softer rocks, with penetration rate increasing with increasing rotational speed. Although the physical properties of the rocks are an indication of their drillability characteristics, no single property correlates per-fectly with the results of percussive drilling. The coefficient of rock strength number, determined by fracturing a sample in a manner similar to that of percussive drilling, correlates well with penetration rates and energy per unit volume for the independently rotated percussive drill. W75-12383

DRILLABILITY STUDIES: PERCUSSIVE

DRILLING IN THE FIELD,
Bureau of Mines, Twin Cities, Minn. Twin Cities Mining Research Center.

Report of Investigations 7684, 31 p, 1972. 11 fig, 10 tab, 11 ref.

Descriptors: *Drilling, *Drill holes, Drilling equipment, Mining, On-site investigations, Construc-

tion equipment.
Identifiers: *Rock drillability, *Percussive drilling,
Laboratory drilling data, Mobile drill units, Tensile strength, Compressive strength, Young's modulus, Poisson's ratio, Penetration rate, Thrust, Speicfic energy, Button bits, Operating pressure

One of a series published by the Bureau of Mines covering research investigations in rock drillabili-ty, this report of field drilling results extends earlier laboratory findings and provides a relatively simple procedure for predicting percussive drilling rates with reasonable accuracy. Two percussive drills mounted on a truck were used to drill a total of 25 rock types, and the results were used to develop a prediction equation. The equation was tested on a set of unrelated laboratory percussive drilling data, and the comparison between pre-dicted and actual rates is shown in tabular form. Of the physical properties investigated, compres-Of the physical properties investigated, compressive strength gave the best correlation with percussive drillability. No physical property by itself is considered a good predictor of drillability. A step that considers the energy output of the drill must be included in the procedure. The simplest procedure for predicting penetration rates is to determine the coefficient of rock strength of the rock to be drilled and use this value to determine the apparent specific energy of the rock. Substituting the apparent specific energy in the equation developed yields a reasonably accurate drillability prediction. (Campbell-NWWA) W75-12384 FRAGMENTATION.

SME Mining Engineering Handbook, Vol 1, Section 11, p 11-1 to 11-60, 1973. 54 fig, 19 tab.

Descriptors: *Drilling, Rock mechanics, Bits, Rotary drilling, Oil industry, *Drillability, Drilling equipment, *Mining.

Identifiers: *Fragmentation, Fracture energy, Plasticity, Penetration rate, Rock strength, Percussion drilling, Blasthole drilling, Down-the-hole hammer, Thermal drilling.

Energy must be supplied to rock by direct or in-direct means to fragment that rock. The amount is dependent upon the properties of the rock and the type of loading system. Fragmentation energy is consumed by three main mechanisms: (1) creation of new surface area (fracture energy), (2) friction (plasticity) and (3) elastic wave energy dispersion. chasticity) and (5) clastic wave energy dispersion. The state of the art in property testing permits only relative measure of the ease with which rock breaks. Such measures have not been rigorously linked to excavation or comminution costs or rates. Laboratory tests for quantifying energy input requirements to cause fragmentation under various controlled degrees of confinement and loading rate will be increasingly important in aiding the understanding and analysis of rock fragmentation systems. (Campbell-NWWA) W75-12387

CHEMICAL FRAGMENTATION.

W. H. Engelmann.
SME Mining Engineering Handbook, Vol 1, Section 11, p 11-112 to 11-123, 1973. 152 ref.

Descriptors: *Drilling, Rock Mechanics, *Rotary drilling, Oil industry, *Drilling fluids, Bits, Bibliographies

Identifiers: *Chemical fragmentation, Penetration rate, Drilling variables, Diamond bits, Inorganic additives, Organic additives, Bit life.

The term chemical fragmentation is defined as the breakage, fracture or comminution of rock or mineral materials by mechanical forces, aided by the presence of chemical solutions. The latter usually are in the form of the aqueous pulp of a ball-mill grinding circuit, or the flushing and cooling fluids pumped down the hollow drill stem to the drill bit. Grinding and drilling are, therefore, the two most important processes benefiting by chemicals in solutions. Although these processes are emphasized, other chemically induced changes in rock toughness, as determined by special laboratory tests are also noted. Any reduction in laboratory tests are also noted. Any reduction in direct-energy requirements, even by a few percentage points, can offer a cost benefit considerably greater than the cost of the chemical additives. While energy per unit volume using additives is higher than for water, the overall cost: benefit is very low. Other chemical enhancement of drilling variable is considered, such as penetra-tion rates. Recent field drilling tests run by the Butool rates. Recent field draining desir July by read of Mines, using anionic, cationic and nonionic surfactant solutions as flushing fluids for surface-set diamond bits have shown that penetration rates can be increased as much as 50% over that with water alone. These examples have demonstrated that chemical additives play an important role in conserving diamond bits and energy in rock fragmentation and removal processes. (Campbell-NWWA) W75-12389

WATER-LEVEL FLUCTUATIONS AND EARTHQUAKES ON THE SAN ANDREAS FAULT ZONE, STORGET

Stanford Univ., Calif. Dept. of Geophysics For primary bibliographic entry see Field 4B. W75-12392

STUDIES IN THE SYSTEM CACO:-FECO3: 1. PHASE RELATIONS; 2. A METHOD FOR MAJOR-ELEMENT SPECTROCHEMICAL

Field 8—ENGINEERING WORKS

Group 8E-Rock Mechanics and Geology

ANALYSIS; 3. COMPOSITIONS OF SOME FER-ROAN DOLOMITES,

Chicago Univ., Dept. of Geophysical Sciences. For primary bibliographic entry see Field 2F. W75-12400

8F. Concrete

HOW TO USE THIXOTROPIC SLURRIES TO SOLVE CEMENTING PROBLEMS, Dow Chemical Co., Tulsa, Okla. Dowell Div.

B. Bradford Drilling, Vol 34, No 9, p 26, June, 1973. 1 fig. 2 tab.

Descriptors: *Cement, *Slurries, *Concrete mixes, Linings, Groutings, Concrete control, Wells, Leakage, Repairing, Construction, Drilling, Maintenance, Permeability, Seepage control. Identifiers: *Thixotropic cement, *Crystalline-gel structure(Cement).

Thixotropic slurries have a crystalline-gel struc-ture capable of being self-supporting before set. The sturry is thin during mixing and pumping, quickly becoming rigid when pumping is stopped, and again becoming fluid when enough force is applied to move it. It contains tri-calcium-aluminate, gypsum and calcium chloride. The properties are described and the advantages of thixotropic slur-ries are listed. (Cambell-NWWA) W75_11886

RUNNING AND CEMENTING DEEP WELL.

MWL Tool and Supply Co., Midland, Tex.

H. E. Lindsey. World Oil, Vol 180, No 1, p 103-110, January, 1975. 2 fig.

Descriptors: *Wells, *Lingings, *Sealants, *Deep wells, *Cleaning, Treatment, Oil wells, Water wells, Joints(Connections).
Identifiers: *Cementing.

Liner tie-back cementing operations plus post cementing procedures are explained. It is important that recommended production liner clean-out procedures be closely followed since they usually are performed under low clearance conditions with lower strength work strings and with a higher incidence of fishing jobs. A list of useful formulas for liner cementing problems is given. (Bradbeer-NWWA) W75-11895

CEMENTING OFF, PLUGGING, AND REDRILLING,

Dow Chemical Co., Tulsa, Okla. Dowell Div. J. E. McGinty, and D. G. Calvert. Water Well Journal, Vol 29, No 7, p 43-46, July,

Descriptors: *Cementing material, *Wells, *Groundwater, Drilling, Water wells, Aquifer characteristics, Subsurface waters, Casing. Identifiers: Lost circulation, Well abandonment, Casing seats, Sanitary seal, Undesirable fluids, Recompletions, Gypsum cement, Neat cement, Concrete, Placement techniques.

In recent months interest has been shown by local, state, and federal control boards in the cementing off and plugging of water wells. The following article discusses these points of interest as well as redrilling techniques. There are many reasons for setting cement plugs. Many times plugs are set during the drilling operations, upon completion of the drilling operations and for zone or well abandonment. The following are some of the specific reasons for cement plugs: (1) whipstock or kick-off, (2) shut off undersirable formation fluids, (3) lost circulating during drilling, (4) recompletion, (5) casing seats, (6) zone abandonment, (7) well abandonment. The effect of mix water and cement

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temperature is a factor that must be considered. when designing systems for plug cementing. There are many cement systems that may be designed for use in plugging wells. The following are some of the most commonly used: (1) Gypsum cement (Gypseal, Calseal), (2) Neat cement, (3) Concrete, (4) Reduced water cements, (5) Regulated fill-up cement. Placement techniques are also discussed. (Campbell-NWWA) W75-12394

8G. Materials

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING, PART 1, Continental Oil Co., Ponca City, Okla For primary bibliographic entry see Field 8C. W75-11865

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING, PART 2, DETECT-ING AND EVALUATING FORMATION PRES-

Continental Oil Co., Ponca City, Okla. For primary bibliographic entry see Field 8C. W75-11866

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING, PART 3, OVER-PRESSURE DETECTION FROM WIRELINE METHODS.

Continental Oil Co., Ponca City, Okla. For primary bibliographic entry see Field 8C.

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING, PART 9, NAVEL WAYS TO DETECT ABNORMAL PRESSURE, Continental Oil., Ponca City, Okla. For primary bibliographic entry see Field 8C.

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING, PART 10, MISCELLANEOUS WAYS TO DETECT AB-NORMAL PRESSURE, Continental Oil Co., Houston, Tex.

For primary bibliographic entry see Field 8C. W75-11869

NEW APPROACH TO PERMEABILITY

A NEW AREDUCTION, REDUCTION, Marathon Oil Co., Littleton, Colo. C. T. Presley, P. A. Argabright, R. E. Smith, and

B. L. Phillips.

Journal of Petroleum Technology, Vol 27, p 592-594, May, 1975. 2 fig, 2 tab, 12 ref.

Descriptors: *Permeability, *Oil reservoir, *Colloids, *Clogging, *Control, *Well filters, Groundwater, Aquifer, Flow augmentation, Wells, Seepage, Gravels, Coarse aggregates, Storage. Identifiers: *Sand bridging.

A new class of polyelectrolytes, polyisocyanurate salts, was evaluated as a permeability reducing agent. The permeability reduction involves plugging interpore flow channels with colloidal particles that are generated in situ. This process is operative up to about 150F. This method has many advantages including the flexibility to designate the final permeability as almost any desired frac-tion of the initial permeability. (Bradbeer-NWWA) W75-11872

HOLE-TO-HOLE GEOPHYSICAL MEASURE-MENT RESEARCH FOR MINERAL EXPLORA-

Geological Survey, Denver, Colo.

J. H. Scott, J. J. Danils, W. P. Hasbrouck, and J.

In: Society of Professional Well Log Analysts Sixteenth Annual Logging Symposium, June 4-7, 1975, 14 p. 6 fig, 21 ref.

Descriptors: *Borehole geophysics, *Electric well logging, *Exploration, Mineral industry, *Cross-sections, Coal, Seismic studies, Radioactivity, Resistivity, Mining, Locating, Subsurface investiga-tions, Mapping, Metals. Identifiers: Uranium ore.

A major deficiency exists in state-of-the-art borehole geophysical measurements available to the mineral industry -- the inability of conventional well-logging techniques to 'see' more than a few meters from a borehole. Hole-to-hole and hole-tosurface geophysical measurements offer the possi-bility of extending the range of investigation to 3-300 m. A review of previous research indicates that a few extended-range borehole geophysical techniques have been developed for specialized problems in petroleum and mineral exploration. Two new applications show special promise: holeto-hole electrical measurements for uranium exploration and hole-to-hole seismic measurements for coal-seam testing. Results of recent field tests and computer model studies indicate that these techniques can improve exploration efficiency by reducing the number of drill holes needed for finding uranium orebodies and by certifying the continuity of coal seams. (Bradbeer-NWWA) W75-11873

GRAPHIC SOLUTIONS TO TUBING MOVE-MENT IN DEEP WELLS, Baker Oil Tools, Inc., Oklahoma City, Okla. For primary bibliographic entry see Field 8B. W75-11875

SEISMIC EXPLORATION: ITS NATURE AND EFFECT ON FISH,
Fisheries and Marine Service, and (Manitoba) M. R. Falk, and M. J. Lawrence. Technical Report Series No CEN-T-73-9, 1973, 51 p. 12 fig. 4 tab. 21 ref.

Descriptors: *Seismic exploration, *Fish, Explosives, *Environmental effects, Seismic waves, Fish management, Marine fish, Aquatic animals, *Fishkill, Canada. Identifiers: Sparker, Aquapulse, Hydrosonde, Airgun, Seismic profile.

The nature of seismic exploration in offshore and inland waterbodies of the Northwest Territories, as well as the effects on fish are described. Litera ture pertaining to the nature and effect of explosive and non-explosive seismic energy sources is presented. A study is described of the effects that seismic energy sources commonly used in the Northwest Territories have on fish. Caged Arctic cisco (Coregonus autumnalis) and other small Coregonids were subjected to the energy sources to determine their lethal characteristics. Aquaflex to determine their lethal characteristics. Aquaflex (a linear high explosive) detonated in 165 foot lengths on the bottom in 10 ft of water, killed fish over an area of 36,200 square foot. A 10 pound charge of 60% Geogel (a point high explosive) detonated 10 ft below the surface in 15 feet of water, killed fish over an area of 25,540 square feet. In contrast, a 300 cubic inch Par Air Gun caused no direct fish mortalities. (Cambell-NWWA)

CAREFUL SAMPLE TAKING IS KEY TO SUC-CESSFUL WELLS, Universal Oil Products, St. Paul, Minn. Johnson

J. R. Carr

Johnson Drillers Journal, p 4-7, March-April, 1975.

Descriptors: *Drilling, *Sampling, *Drilling samples, *Drillers logs, Drill holes, Exploration, Subsurface mapping, Wells, Rotary drilling, Quality control, Reliability, Heaving.

Identifiers: Borehole description, Depth descrip-

Sampling should be as frequent as necessary, that is, at least one sample for each geologic unit penetrated and as many as possible within the unit to adequately describe the aquifer characteristics.

The different uphole velocities of the various drilling fluids necessitate different sampling intervals. For example, the normal uphole velocity in rotary air drilling is 3,000 feet per minute. This high rate makes it necessary to sample continually or to periodically stop the drilling and continue circulation to obtain a clean sample. Shavings produced by driving the casing are a true sample of the well if a careful depth description is kept. The experienced driller may also aid the description through his knowledge of the formation obtained through the rate of penetration by the drill bit. (Bradbeer-NWWA) W75-11881

CORROSION.

Water Well Journal, Vol 29, No 6, p 46-48, June, 1975

Descriptors: *Corrosion, *Corrosion control, *Coatings, Chemical degradation, Deterioration, Oxidation, Water softening, Control, Films, Carbon dioxide, Dissolved oxygen, Tennessee. Identifiers: *Galvanic cells.

Corrosion is a natural chemical process with a rate governed by acidity of the water, electrical con-ductivity, oxygen concentration, and temperature. Carbon dioxide in rain water, unless buffered by limestone, combines with the water to form car-bonic acid. Galvanic cells created by the juxtaposibonic acid. Caivanic cells created by the juxtaposi-tion of two dissimilar metals aid in corrosion of a water system. Available oxygen will combine with metals dissolving the pipe molecule by molecule. Thus the more available the oxygen, the faster the corrosion. Since corrosion is a chemical reaction, the rate of corrosion increases with increasing temperature. Control involves reduction of acidity by buffering either in the water or as a filter in the system itself and reduction of dissolved oxygen. Polyphosphate compounds, which lay down a thin film on interior metal surfaces of hydraulic equip-ment minimizing the water metal contact, minimize corrosion. (Bradbeer-NWWA)

GRAPHICAL METHOD SPEEDS DEVIATED

GRAPHICAL METHOD SPEEDS DEVIATED WELL CASING DESIGN,
Champlin Petroleum Co., Wilmington, Calif.
B. Woodlan, and G. E. Powell.
World Oil, Vol 180, No 2, p 40-43, February 1, 1975. 6 fig, 1 tab, 6 ref.

Descriptors: *Well casings, *Drilling, *Design, Methodology, Weight, Length, Pressure, Buoyan-cy, Tension, Collapse, Water wells, Oil wells,

Identifiers: *Bending load, Directional drilling,

Seven major factors are considered in the graphical casing design method for directionally drilled wells, including: (1) byoyancy, (2) bending load, (3) tension, (4) collapse, (5) correction, (6) (3) tension, (4) collapse, (5) correction, (6) deviated hole support, and (7) burst. To minimize calculations and trial and error methods, all pertinent equations have been put in graph form for common casing goods. Adequate safety factors are included. An example calculation is made. (Bradbeer-NWWA) W75-11896

TRACERS AID PLACEMENT OF STIMULA-TION FLUIDS,

Getty Oil Co., Andrews, Tex. E. Lilley.

Oil and Gas Journal, Vol 72, No 24, p 62-64, June 17, 1974. 6 fig, 1 tab.

Descriptors: *Tracers, *Secondary recovery(Oil), Pescindus: Tracers, "Secondary recovery(on), *Radioactivity techniques, Tracking techniques, Injection, Hydrofracturing. Leakage, Plugging, Testing procedures, Groundwater movement, *Texas.

Identifiers: Cochran County(Tex), Ward Countv(Tex)

new procedure using radioactive tracers is useful in placing well-stimulation and fracture fluids, isolating theif zones in injection wells for proper placement of plugging agents, and in controlling water flow from a permeable zone in the middle of an oil pay. The method of emplacement is described and related problems discussed. This method has been utilized in the North Ward Estes field, Ward County, Texas and in the Slaughter Field, Cochran County at depths of approximately 2500 ft and 5000 ft respectively. The results are tabulated. (Campbell-NWWA)

USE OF PLASTIC PIPE FOR SEWERS, Otay Municipal Water District, Spring Valley,

G. M. Reiter, and L. Hirsch. Public Works, Vol 104, No 4, p 88-91, April. 1973.

Descriptors: *Sewers, *Plastic pipes, Construc-tion, California, Pipelines, Costs, Laboratory tests, Waste water treatment. Identifiers: Otay Municipal Water District(Calif).

Plastic pipes are beeing used in the construction of sanitary sewers for a California area having a steep hillside terrain with rock outcroppings. After much construction bidding and rebidding for the 70,000 feet of pipeline, the Otay Municipal Water District permitted the use of plastic pipes. These pipes have demonstrated the following adpipes have demonstrated the following advantages: low material cost; long, lightweight pipe lengths, permitting easy handling, storage, and laying; pipe flexibility allowing maximum curvatures; fast, positive air pressure testing; narrow trench digging; and, simpler manhole construction trench digging; and, support manners with longer spacing and compatibility with plastic laterals and saddles. Prior to use of such pipes, specific laboratory tests were performed. Tests laterals and saddles. Prior to use of such pipes, specific laboratory tests were performed. Tests consisted of subjecting pipe specimens to extreme conditions - far exceeding normal anticipated operating conditions for periods up to 18 days. The tests corroborated results reported from major research and testing programs. (Sandoski-FIRL) W75-11907

PIPE FLOW MEASUREMENTS BY THE PULSE VELOCITY METHOD WITH RADIOACTIVE ISOTOPES.

Wurzel

P. Wurzei.
The Civil Engineer in South Africa, Vol. 15, No. 2, p 33-38, February, 1973. 4 fig, 1 tab, 7 ref.

*Pipe *Measurement, flow. Descriptors: *Radioisotopes, Instrumentation.
Identifiers: Scintillation rate-meter.

A radioactive system for broad angly detection of pipe flow measurement using AERE 1413A scintil-lation rate-meter gives flatter wave forms with lower repeatability and requires relatively higher radiation mass dosages per injection as compared with a narrow angle detection device. However, using an automatic on/off light system set at a preselected radiation threshold level, this system gives excellent repeatability and requires low radiotracer concentrations per injection. The instrumentation is light and portable, and requires no expert supervision. The criteria for selection of the tracer method are speed and convenience rather than high accuracy and precision. However, an accuracy of plus or minus 5 percent can be achieved and the danger from radiation is negligible. (Sandoski-FIRL)

W75-11916

SAFETY INSTALLATION FOR PREVENTING POLLUTION BY PIPELINES, G F Wittgenstein

United States Patent 3,721,270. Issued March 20, 1973. Official Gazette of the United States Patent Office, Vol 908, No 3, p 605-606, March 20, 1973.

Descriptors: *Pipelines, *Safety, Plastics, Instru-mentation, Monitoring, Patents, Water pollution control, Pollutant identification, Monitoring. Identifiers: Detectors, Vessels.

A safety installation for preventing pollution by pipeline is provided with at least one sector equipped with a jacket of plastic material. The jacket surrounding the pipeline is sealed at its ends, with a annular gap formed between the pipeline and its jacket containing a fluid and inserts and spaces. At least one vessel is provided for collecting the evacuated flow and liquid presence detector which gives a warning and remotely controls operations. A fluid-tight hollow space contains a gas under a pressure different from atmospheric pressure and connects the in-terior of at least one vessel to a crack in the pipe wherever the crack occurs. Instruments permantely monitor the tightness of the space, which com-preses at least one perforated gap. Near each vessel is a liquid presence detector and every horizontal run gap of the space is filled with water. The jacket is pierced by at least one perforation, and there is a chimney surrounding the perforation. A channel leads into the chimney above the level of water and to a vessel to form part of the space. Every inclined run gap of the space is perforated at a low point in its jacket, and the channel sur-rounding the perforation and leading to the vessel forms part of the space. (Sandoski-FIRL) W75-11934

HYDRAULIC SEWER PIPELINE CLEANER, O'Brien Mfg. Co., Inc., Chicago, Ill. (assignee). For primary bibliographic entry see Field 5D. W75-11944

PIPE RELINING METHOD AND APPARATUS, R M Bremner

Australian Patent 434,556. Issued April 19, 1973. Official Journal of Patents, Trade Marks Designs, Vol 43, No 14, p 1373, April 19, 1973.

Descriptors: *Pipes, *Linings, Plastics, *Patents, Repairing, Rehabilitation. Identifiers: Polyethylene liners.

A piping renovation method utilizes a polyethylene linear drawn through with an oscillat-ing motion. An oscillating motion is set up by a cable attached to a pneumatic power unit, to which is secured the high density polyethylene lining tube, as they are drawn through the underground piping. Any residual friction inside the piping is overcome and damage to the lining prevented. The gap between the lining and the piping is filled with an embedding mortar to secure the lining in place. (Sandoski-FIRL) W75-11945

APPLICATION OF PVC BELL-AND-SPIGOT PRESSURE PIPES IN CONSTRUCTION OF WATER SUPPLY LINES (DIE ANWENDUNG VON PVC-MUFFENDRUCKROHREN BEIM BAU VON WASSERVERSORGUNGSNETZEN), For primary bibliographic entry see Field 8A. W75-11949

RESORT COMMUNITY PUTS ALL UTILITIES UNDERGROUND.

Water and Sewage Works, Vol 122, No 5, p 94-95,

Field 8—ENGINEERING WORKS

Group 8G-Materials

Descriptors: *Pipes, *Sewerage, Plastic pipes, materials, Construction Clay Joints(Connection), Infiltration, Costs, Virginia, Waste water treatment.

Identifiers: Armco Truss Pipe, Acrylonitrile-butadiene-styrene.

Kingsmill on the James is a 2900 acre resort and re-sidential development is Virginia. Construction was begun in 1972 and is expected to continue 15 years. One of the earliest construction phases was the placing of electricity, water, sewer and telephone lines underground. Armco Truss Pipe is being installed for the sanitary sewers. The pipe is made by extruding ABS (Acrylonitrile-butadienestyrene) resin into a truss shape to form an inner and outer wall supported by webs. The voids between the webs are filled with lightweight concrete. The pipe is about three times longer than vitrified clay pipe which allows for fewer joints and faster installation. The joints are solvent welded to reduce infiltration/exfiltration. Separate contracts were signed on four different residential sites in Kingsmill on the James. In each case, the successful contractor bid the Armco pipe substantially lower than the VCP. (Orr-FIRL)
W75-12338

EPOXY RESIN APPLICATION AT SEWAGE

For primary bibliographic entry see Field 5D. W75-12349

CREW TRAINING. Exxon Co., Houston, Tex. J. V. Langston. Drilling, Vol 36, No 7, p 63-65, May, 1975. 4 fig.

Descriptors: *Drilling, *Training, *Labor, *Manpower, Personnel, Schools(Education). Identifiers: *Driller training, Toolpusher, Derrick man, Rotary helper, Drilling rig crew.

The increasing complexity of drilling operations, a large increase in cost, and the critical shortage of trained people at a time of rapid expansion in the number of drilling rigs are the contributing factors to the greater importance placed on drilling crew training. The article stresses that the level of experience of the average crewman will decrease as a large number of untrained crews are employed in the extending drilling operations. The schools established at the present are good but unable to handle the anticipated volume of training. A plan is suggested that includes a standard test of ability before qualification for promotion. (Bradbeer-NWWA) W75-12385

SPECIALIZED UNDERGROUND EXTRACTION

For primary bibliographic entry see Field 8B. W75-12388

CHEMICAL FRAGMENTATION, For primary bibliographic entry see Field 8E. W75-12389

WATER-LEVEL FLUCTUATIONS EARTHQUAKES ON THE SAN ANDREAS FAULT ZONE, Stanford Univ., Calif. Dept. of Geophysics

For primary bibliographic entry see Field 4B. W75-12392

IN

RECENT APPLICATION OF GEOPHYSICAL METHODS IN COAL MINING, National Coal Board, London (England). For primary bibliographic entry see Field 8B.

OF APPLICATION WELL LOGGING TECHNIQUES TO MINING EXPLORATION BOREHOLES, British Petroleum Co. Ltd., Sunbury-on-Thames

(England). Research Centre.

P. Threadgold.

In: Ninth Commonwealth Mining and Metallurgical Congress 1969, Mining and Petroelum Geology Section, Paper 11, 17 p, 9 fig, 2 tab.

Descriptors: *Boreholes Geophysics, Electrical Logging, *Mining, *Well Logging, *Wells, Aquifer characteristics, Resistivity.

Identifiers: Hydrocarbons, Mining exploration, Sonic log, Formation density, Neutron log, Gamma log, Logging Program Design, Economics.

The development of well-logging in its applications to exploration for hydrocarbons is traced, and it is shown that the interpretation methods used for estimation of porosity in the presence of a multicomponent rock matrix can be used for any component system. The routine logging tools used for porosity estimates are briefly described, and their responses are discussed. Methods of using these tools to resolve problems of mixed lithology are described and illustrated; these methods can be used when the constituents of the rock are known so that their relevant 'logging characteristics' can be defined. The application of other routine logging methods to mining exploration is considered more specifically from a diagnostic viewpoint; however, quantitative use of these measurements in specific areas is not discounted. The design of logging programmes to solve specific problems is described. Various practical problems which have arisen, largely because of the development of well-logging primarily for the petroleum industry, are considered. It is concluded that the technical problems which may well have been responsible for the relatively small use of well logs outside the petroleum industry are no longer insurmountable. A major problem of economics still remains. It is suggested, however, that modern trends in logging justify serious reappraisal of their possible applications to mining ex-ploration. (Campbell-NWWA) W75-12398

FRESH WATER STRATA OF MISSISSIPPI AS REVEALED BY ELECTRICAL LOG STUDIES, Millsaps Coll., Jackson, Miss. For primary bibliographic entry see Field 4B. W75-12399

8H. Rapid Excavation

MOLE DRIVES THROUGH CLAY-SHALE FACE.

Engineering News Record, Vol. 190, No. 16, p 17, April 19, 1973, 1 fig.

Descriptors: *Tunneling machines, *Tunnels, Storm drains, Soils, Rocks, Ohio. Identifiers: Euclid(Ohio).

A tunnel boring machine (TBM) recently holed through a 4180-foot storm drainage tunnel in Euclid, Ohio. The TBM, made by Jarva, Incorporated, of Solon, Ohio, has a rotating cutterhead that operates within a steel shield in soft ground, but can be extended forward of the shield when mining in hard rock. To cope with any shield rotation, the \$780,000 TBM's cutterhead operates in either direction. The machine's best day of advance was 45 feet in a mixed face of shale and clay, functioning alternately as a hard rock boring machine and a soft ground shield-type. (Sandoski-FIRL) W75-11911

81. Fisheries Engineering

SEISMIC EXPLORATION: ITS NATURE AND SEISMIC EAFLOSH,
EFFECT ON FISH,
and Marine Service, Winnipeg (Manitoba). For primary bibliographic entry see Field 8G.

LIFE HISTORY, ECOLOGY, AND MANAGE-MENT OF THE CARP, CYPRINUS CARPIO LINNAEUS, IN ELEPHANT BUTTE LAKE. New Mexico Agricultural Experiment Station, University Park. For primary bibliographic entry see Field 6B. W75-11972

DISTRIBUTION AND BIOMASS MACROPHYTES IN LAKE DGAL MALY, Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland) B. Gerlaczynska.

Ekologia Polska, Vol 21, No 48, p 743-752, 1973. 1 fig, 5 tab, 9 ref.

Descriptors: *Distribution, *Lake fisheries, *Biomass, *Aquatic plants, Submerged plants, Floating plants, Chemical properties, Marsh Floating plants, Chemical properties, Marsh plants, Aquatic weed control, Bulrushes, Cattails, Lakes, Europe, Fish reproduction.

Identifiers: *Lake Dgal Maly(Poland), *Poland, *Macrophytes, Hornwort, Burr-weed, Sedge, Water horsetail, Pondweeds, Schoenoplectus, Water moss, Water weed, Stratiotes aloides.

Macrophyte occurence, distribution, biomass, and their chemical composition in relation to habitat were studied in Lake Dgal Maly, Poland. Vascular flora occupied 4.09 hectares (28.8% of lake area); of this 1.34 hectares or 9.4% were emerged and 2.75 hectares or 19.4% submerged plants. Macrophyte biomass weighed 55.52 tons fresh weight or 12.209 tons dry weight. Fourteen species weight or 12.209 tons dry weight. Fourteen species were found. Phragmites communis (21.6% of total area occupied by littoral plants) was dominant plus 2.4% Typha angustifolia, 3.7% T. latifolia, 2.4% Schoenoplectus sp., and 1.5% Carcar sp. Submerged and floating plants consisted of 65.6% Ceratophyllum demersum, 0.8% Fontinalis antypyretica, and 0.5% Stratiotes aloides. C. demergum contrained the largest amount of calcium (8.1% sum contained the largest amount of calcium (8.1% of dry mass) and least calcium contents were in Schoenoplectus Tabernaemontani (0.52%). C. demersum contained 0.39% phosphorus and Typha latifolia 0.11% Typha angustifolia contained 1.84% nitrogen and C. demersum 0.84%. Development of marsh plants limits occurence of underwater meadows and causes deteriorating conditions for phytophilous fish reproduction. Mowing must be done every few years to limit helophyte development. (Buchanan-Davidson-W75-11993

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. XIV.
THE RELATIONS BETWEEN THE FISH AND THE RELATIONS BELL.
OTHER BIOCENOTIC COMPONENTS
(SUMMING UP THE STUDIES),
(SUMING UP THE STUDIES),
(SUMING UP THE STUDIES),
(SUMING UP THE STUDIES),
(SUMING UP THE STUDIES),

Ecology. Z. Kajak, and J. Zawisza.

Ekologia Polska, Vol 21, No 41, p 632-642, 1973. 8 tab, 26 ref.

Descriptors: *Fish stocking, *Lakes, *Biological communities, *Fish diets, Aquatic plants, Carp, Pikes, Perches, Phytoplankton, Zooplankton, Nannoplankton, Productivity, Biomass, Herbivores, Fecundity, Juvenile fish, Fish parasites, Growth rates, Benthos, Europe. Identifiers: *Lake Warniak(Poland), *Poland, Roach, Tench, Bream.

A review of previous research shows that in-troduction of fish, primarily carp, into Lake Warniak, Poland from 1967-1969 caused phytoplankton biomass and production to decrease and organic matter decomposition and nannoplankton biomass to increase. Small zooplankton species increased, but biomass and productivity of large species decreased. Dominant zooplankton species produced 2-10 times more eggs and body length increased up to 37%. Increasing fish pressure decreased the benthos level without changing its dynamics. Where fish pressure was high, faunal biomass associated with macrophytes and the average individual weight was smaller. Spatial distribution of pike, roach, perch, and most juvenile fish forms did not change. Young carp were used as food by bigger pike, but carp did not gather on spawning grounds of roach, tench, and crucian carp or feed on their spawn and larvae. Carp were infected by Trichodina, Dactylogyrus vastator, D. anchoratus, and Ergasilus sieboldi and an acute Septicaemia. Growth rates of fish decreased from 1967 to 1969, but increases in carp and bream body weight were generally high and their conditions satisfactory due to better utilization of smaller mounts of consumed food. Fish pressure correlated with the decrease of benthos biomass. (Buchanan-Davidson--Wisconsin) W75-11998

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. XIII.
DISTRIBUTION AND BIOMASS OF THE LEMNACEAE AND THE FAUNA ASSOCIATED
WITH THEM,

Warsaw Univ. (Poland). Zoological Inst.
D. M. Kobuszewska.
Ekologia Polska, Vol 21, No 39, p 611-629, 1973. 5 fig, 5 tab, 25 ref.

Descriptors: *Fish farming, *Spatial distribution, *Aquatic plants, *Aquatic animals, Biomass, Insects, Habitats, Periphyton, Invertebrates, Gassects, Habitats, Feriphyton, Invertebrates, Gas-tropods, Oligochaetes, Amphipods, Submerged plants, Herbivores, Fish food organisms, Lacewings, Aquatic insects, Larvae, Mayflies, Diptera, Europe. Identifiers: *Lake Warniak(Poland), *Duckweed, Flora-fauna associations, Monophagous insects.

Studies of Lemnaceae distribution and biomass and the composition and abundance of associated invertebrate macrofauna were made in Lake Warniak, Poland, in 1969-1970 to determine the effect of increased fish stock on lake biocenosis. Submerged Lemnaceae were represented by Lemna trisulca; floating Lemnaceae by Spirodela polyrr-hiza plus Lemna minor. Floating Lemnaceae varied with water level fluctuations, wave motion, and emergent vegetation. The biomass of floating Lemnaceae was highest at distances greater than one meter from shore but lower than that of other one meter from shore but lower than that of other macrophyte species. Biomass of submerged Lemmaceae was highest in June. Quantitative and qualitative studies were made of the fauna associated with the submerged and floating Lemmaceae. Large Anisoptera and Neuroptera larvae were found on submerged Lemmaceae, with Ephemeroptera, Chironomidae, Oligochaeta, Trichoptera, and Gastropoda dominant. On floating Lemnaceae, Collembola, Hemiptera, Gastropoda, and Hydrozoa were dominant. The number of fauna associated with submerged Lemnaceae averaged 1674 individuals/sq m of lake surface and with floating Lemnaceae averaged 155 inface and with floating Lemnaceae averaged 155 individuals. Biomass fluctuations of Lemnaceae and changes in associated fauna were affected by fish grazing on plants and the associated fauna. Unstable rates of Lemnaceae development caused variations in the amount of associated fauna. (Buchanan-Davidson-Wisconsin) W75-12009

DAILY FALL ACTIVITY AND DIRECTION OF MOVEMENTS OF FISH IN LAKE

QUENOUILLE IN THE LAURENTIANS, (IN FRENCH),

National Inst. of Scientific Research, Quebec. For primary bibliographic entry see Field 2H. W75-12064

PRAIRIE POTHOLE ECOLOGY AND THE FEASIBILITY OF GROWING RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) IN PRAIRIE POTHOLES, North Dakota State Univ., Fargo. Dept. of Zoolo-

G. L. Myers.

MS thesis, May 1973. 98 p. 19 fig, 11 tab, 34 ref.

Descriptors: *Potholes, *North Dakota, *Fish farming, "Rainbow trout, "Fish food organisms, Mortality, Fish stocking, Salmonida, Oxygen sag, Lake morphology, Chemical properties, Phytoplankton, Zooplankton, Invertebrates, Lake morphotogy,
Phytoplankton, Zooplankton, Invertebrates,
Growth rates, Water levels, Winterkilling, Benthic
fauna, Salamanders, Mercury, Diptera, Amphipods, Water temperature, Alkalinity, phipods, Water temperature, Alkalinity, Phosphates, Nitrogen compounds, Hard-ness(Water), Specific conductivity, Costs, Eutrophication, Copepods, Daphnia, Fish harvest, Water polytics of the Particle Water pollution effects, Rooted aquatic plants, Waterfowl, Competition. Identifiers: *Prairie pothole lakes.

Commercial rainbow trout production is not feasible in four North Dakota pothole lakes studied, although trout growth did reach commercial size in one season. Mortality was due to a combination of factors: initial stocking mortality, diurnal dis-solved oxygen fluctuations, water temperature, ammonia toxicity, and bird predation. Trout ate the same foods as salamanders but in different proportions. Trout consumed amphipods, Chaoborus, and chironomids. They selected Chaoborus when present, then relied on amphipods. Competition with waterfowl for food was not demonstrated. Nitrogen was the limiting nutrient in three lakes; the fourth lake had high nitrogen and ortho-phosphate levels due to a septic tank discharge. Density of rooted vegetation, Ceratophyllum demersum and Myriophyllum exalbescens, appeared to have a negative correlation with blue-green algae blooms. If an algal bloom occured early in the season, rooted vegetation was stunted; otherwise Ceratophyllum dominated. In three lakes the dominate algae was Aphanizomenon Succession from Anabaena to Aphanizomenon to Microcystis was observed. Daphnia were the most numerous zooplankters. Copepod populations often followed fluctuations in Daphnia. Benthic invertebrates consisted of amphipods and chironomids. The number of oligochaetes appeared to increase, relative to chironomids, as organic enrichment increased. (Buchanan-Davidson-Wisconsin).

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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